



CURIOSITIES
OF NATURE AND ART.



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Curiosities
O F
Nature and Art
I N
HUSBANDRY
A N D
GARDENING.

CONTAINING

Several new Experiments in the Improvement of Land, Trees, Fruits, &c. And also nice and useful Observations relating to the Vegetation and Propagation of Plants; with choice Secrets to make Plants, Flowers and Fruits larger, more beautiful, and to ripen earlier than usual.

From the French of P. de Cossigny de Vallemont.

With several Copper Cuts.

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Printed for D. Brown, at the Black Swan without Temple-Bar; A. Roper, at the Black Boy over against St. Dunstan's Church in Fleetstreet; and Fran. Coggan in the Inner-Temple Lane, 1707.

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 beautiful, and to make them last



Printed for D. Browne at the Golden Ball in St. Dunstons Church-yard
 By A. M. Wood, at the Black and White over against St. Dunstons
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THE
AUTHOR'S
PREFACE.

10. 11. 09.

THere is not any Part of Natural Philosophy that more nearly concerns us than the Vegetation of Plants: not only because the Tiltage of the Earth was the Occupation of Men in the beginning of the World; but also an Account of the Profit we reap from it, and of the Pleasure we receive in raising up Fruits and Flowers. In the most happy Ages of the World, Men fed only upon the Products of the Earth; and even at this Day we reckon Fruits among our most delicious Morsels. Plants are allow'd a Place among the things that are most necessary: Such of them as grow in our Kitchen-Gardens are a Part of our most usual Nourishment; and Physical Plants help to restore our Health, when Sicknefs has impair'd it.

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In the most flourishing State of the Roman Commonwealth, the highest Praise could be given to a Citizen of Rome, was to say of him, that he labour'd well his own Spot of Ground: And at the Plough it was that those incomparable Men were found, who after having commanded Armies, beaten the Enemies, and restor'd the Quiet of the State, return'd from the midst of Triumphal Honours, directly into the County to Till their Land with their own Hands.

I pretend not to oblige Mankind once more to embrace the Toils and Hardships of a Country Life. Our Manners now a days are not the Manners of those happy times. The Love of Ease, Luxury, and Voluptuousness have gained the upper Hand: and the Culture of the Earth is now fallen to the Lot of Men, whom we esteem miserable, and born to labour. But I wish at least that we took more Care to improve our Estates; and apply'd our selves to perfect Agriculture and Gardening; as we have endeavour'd to bring to perfection the other Arts and Sciences, that are less useful to Life. In the Philosophical Transactions of the Royal Society of England, we find that the Persons of Quality, and Men of Learning, who are Fellows of it, have made excellent Discoveries to that End: but 'tis not enough that the Learned only should have new Lights in the Art of Husbandry: those important Secrets should likewise be imparted to Countrymen and Peasants, to whose Lot those Labours are at present devolv'd. My design therefore in publishing this Treatise, is to make known to the common People, all the late and useful Discoveries of the Learned, that relate as well to Agriculture

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as Gardening: to the End that the World may reap the Advantage of them; and that by obliging the Earth to yield us more plenteous Crops and Harvests, we may no longer have reason to apprehend those dreadful Scarities of Corn, with which both City and Country have from time to time been miserably afflicted. In this Design it is that I communicate to the Publick in the following Treatise, all the Experiments that have been made in order to the Multiplication of Corn. I cannot imagine what inducements can prevail with some Men to make a Mystery of things, which in my Opinion, they ought rather to publish at sound of Trumpet. Certainly such Men must have laid aside all Humanity, and forget that all Mankind are their Brothers. I freely teach several ways of considerably increasing the Revenues of Country Estates, by imparting Fertility to the Earth, and Fruitfulness to Animals, and I should think my self unworthy to be reckon'd among the Race of Men, if I conceal'd any thing relating to either.

I have intermixed these Occupations of the Country Life, with curious Seerets for Flowers, and for Fruits: and have endeavour'd from time to time to raise up the Minds of my Readers by Philosophical and sublime Speculations, which as near as I was able, I have accommodated to the Capacity of all that can read them; And while I make manifest the Miracles of Nature in the Vegetation of Plants, I take notice of them chiefly to make it appear, that Matter, which of it self is only a rude, lifeless and senseless Lump, wholly incapable of ever giving it self the least Motion, must of necessity be mov'd and acted by an Intelligence infinitely wise and powerful, to produce Effects so surprizing, and

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proper to puzzle and confound the haughty Reason of Man.

I hope I have given this Work all the Demonstration and Evidence that can be requir'd in Matter of Physicks; where every thing is decided by Reason and by Experience, which ought mutually to support and mainrain each other: 'twill be seen that I have never separated these two things; but all along have preserv'd between them that Agreement and good Understanding, which composes the whole Substance and Solidity of Natural Philosophy. I produce no Experiment, which I do not explain and fortifie by Reason: and I likewise advance no Reason, but what I immediately justifie by Experience. When the Subjects of which I treat are abstract, their Causes occult and hard to be understood, and whenever I cannot fully discover the Rise and Descent of any Effect, I make no scruple to acknowledge the Insufficiency of Philosophy in that Matter. There are, says Pliny, several Secrets in the Majesty of Nature, for which no Reason can be given. Aristotle had said long before, that a Man must be conceited to a Degree of Folly, to think he can explain all of them. Seneca makes a Goddess of Nature, and gives her a secret Sanctuary into which 'tis not easie to gain admittance. Nature, says he, is not forward to reveal her Mysteries; and we sometimes fancy our selves initiated in them, while we are yet but at the Porch of her Sacred Temples. All her Secrets come not within the Reach of humane Capacity; but are shut up and ly hid in the inmost Recesses of a Sanctuary, far remov'd from the sight of Man. *Rerum Natura Sacra sua non simul tradit. Initiatos nos credimus; in vestibulo*

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stibulo ejus hæremus. Illa arcana non promiscue, nec omnibus patent: reducta & in interiori Sacratio clausa sunt. *Natur. Quæst. lib. 7. chap. 31.*

Though these Words of Seneca have a specious appearance of Truth, yet they savour very much of the Religion of the Heathens, who made Gods of the very Onions that grew in their Gardens. The Peripateticks, who believ'd the World eternal, in consequence of that mistaken Opinion, made Nature a Goddess, who presided over all the things of the Universe. From thence come all these so pompous Descriptions which we find in the Heathen Philosophers; and in which 'tis but too apparent that they regarded Nature as a God, a Genius, an Intelligence, a Demi-God, who govern'd the World. Nature nevertheless in that Sense is a meer Chimera, that has no manner of existence, that has nothing real and effective, no more than Fortune and Chance, to whom notwithstanding the Pagans erected Temples, and rais'd Altars. This Error has been carried yet farther: for they made Real Beings of things, that are only meer Negations, and simple Privations, as Death, Ignorance, Blindness, and the like. The mischief is, that these false Notions which the Peripateticks first set abroad, are crept into the ways of speaking, that are very common among Christians. 'Twere well we were more reserv'd and sparing in the use of those Expressions; and that according to the Principles of Christianity, we reduced them to their true Idea, or Signification; for why should Christians, who are deliver'd fr m the Errors of the Pagans, continue to speak like them?

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'Tis certain that Moses, who first of any treated of natural things, allows Nature no share in the Government of the Celestial and Elementary Worlds. God is every where acknowledged as the sole Intelligence that acts in the vast Frame of the Universe. Job, David and Solomon, who speak so often of Miracles, of Plants, of Animals, and of Meteors, never ascribed the least power to Nature, but gave the glory of all to God; the sole Actor on this immense Scene. Even in the Gospel, when mention is made of the Beauty and lively Colours of the Lillies of the Fields, 'tis not said that Nature thus adorn'd them, but in express Terms, that 'tis God who takes care to cloath them in such a manner, that Solomon in all his Glory was not arrayed like one of them. Thus too Christians ought to speak, if they would speak properly, and according to the Principles of their holy Faith. The other is a Relick of Heathenism, which the Peripateticks have kept up in their Schools of Philosophy, where these Axioms, which would indeed be excellent, if the Name of God were used instead of Nature, are continually sounded in our Ears. Nature is most Wise. The Work of Nature is a Work of Understanding. Nature does nothing in vain. Nature is never frustrated of her End. Nature does always what is best. Nature acts by the most simple Methods. Nature never flies out into superfluous things, and always supplies whatever is necessary. Nature does all things for her own preservation. Nature is the Physician that heals Diseases. Nature is always watchful for the preservation of the Universe. Nature abhors a Void. In a Word, Nature is an Idol

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Idol, which ought to be thrown down, if we would render to God the Glory due to him; and of which he is so jealous, according to the Expression of the Scripture, that he will never yield it to any.

Cardinal Bellarmin begins the Revisal of his Works of Controversie, by declaring, that he is sorry that he had ever given to St. Paul the Title of Divus, because the Heathens gave it to their false Gods; and he absolutely condemns the use of it in regard to Saints. So true is it that we ought to avoid the ways of speaking of the Heathens, and not make use of Expressions that include Idea's that are purely Pagan; at least unless we modify them if we can, by declaring, that we restrain them to a signification that is just, proper and innocent.

This is what I have endeavoured to do through the whole Course of this Work, where Nature is so often brought upon the Stage. 'Twas impossible to avoid the frequent Repetition of an Expression so much in use, and which has been, as it were, adopted to signify what God does for the Preservation and in the Government of the Universe, according to the general Laws of Motion, which he first established in Matter; and to distinguish his Action and his Power over material things, from what he does in the Kingdom of Grace over the Substances that are spiritual.

I declare therefore, that when I make use of the Word Nature, I mean to signify by it, what God operates in mixt Bodies, such as Minerals, Plants and Animals, by the general Laws of Motion, which he first imprinted on Matter. These Laws are the Spring, the Elastick Force, from whence proceeds whatever is done in the sensible
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and insensible Parts of Matter. These Sacred Laws, from which God never derogates, are the Mechanicks of all the Operations, which we observe in the great Automaton of the Universe. These Laws are the Principles of the Motion, of the Rest, of the Contexture, of the Order, and of all the Variations that happen in the Matter of which the World is compos'd. These Laws in short are what I call Nature. And in this Sense Nature is the cause of all that happens, and of all that is produced in Material Substances. Thus we may celebrate Nature without fearing to make a Chimera, or to pay Worship to an Idol, which is nothing; because by that Word we mean the general Laws of Motion, of which God is the Author and Director. Nature, or the System of these Laws, is what Marsilius Ficinus calls the Organ, the Art, the Instrument of the Deity, the Work of Providence, the Mechanicks of God: *Natura Instrumentum Divinitatis, Ars Dei, Instrumentum Providentiæ, Dei artificiosum Organum.* We will add with the same Philosopher, that Nature, that is to say, Matter put into Motion, according to the adorable Wisdom of these divine Laws, is as it were a great Book, full of the Deity; and a Mirror in which we most plainly behold God and his Providence: *Natura est velut Liber magnus Divinitate plenus, Divinorumque speculum.* Nature, considered as the Aid of God, present, acting in all things, and putting in Motion all second Causes, Nature, I say, under this Idea, cannot be too much rever'd. We cannot say too much when we speak of her, or rather our Expressions always fall short, seeing 'tis God himself.

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I am not ignorant that our Schools of Philosophy distinguish between two sorts of Nature; one of which they call *Natura naturans*, which is God; the other *Natura naturata*, which is the second Causes; but these hard Terms cannot be brought to buckle to our Language, and therefore they have remained in the Colleges, without ever daring to appear abroad in the World. Thus the Exactness and good Intentions of our Professors in Philosophy, are in this Case of no service to us, because the ill Custom that has descended to us from the Ancients, still prevails.

To conclude: I cannot but promise my self that the following Treatise will find a favourable Reception from the Publick; seeing it solely tends to the Perfection of those Arts, that are of the greatest Advantage to Mankind: and I also hope, that none will be so disingenuous, as to condemn the Methods and Prescriptions herein given, before they have made Experiments of them. For in all Arts and Sciences many things seem difficult to the Unexperienced, nay even impossible to be performed, which upon Trial nevertheless they find most easie and natural.

THE

THE PREFACE

I have not hesitated to publish this book, because I believe it will be useful to many of my countrymen. I have not hesitated to publish it, because I believe it will be useful to many of my countrymen. I have not hesitated to publish it, because I believe it will be useful to many of my countrymen.

The author of this book is a man of letters, and a man of letters is a man who is not content with the ordinary knowledge of his countrymen. He is a man who is not content with the ordinary knowledge of his countrymen. He is a man who is not content with the ordinary knowledge of his countrymen.

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CURIOSITIES

OF

NATURE and ART,

Concerning the
Vegetation of PLANTS.

10. 11. 09.

CHAP. I.

The Delights of Agriculture, and Gardening.

THE Town has its Pleasures, as well as the Country; and if Probity were the Rule, and the Guide of Men's Actions, in my Opinion, the Sweets of Company and Conversation ought to be prefer'd to a Private Life, and to all the Charms that Nature affords us in Retirement, and in Solitude. But how taking or alluring soever the Pleasures of the Town may seem to us, the Duplicity and Double-Dealing that are there so frequent, and that marr all those Delights, oblige us to declare our selves in favour of the Simplicity

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city of a Country-Life: Its Pleasures are, indeed, less bright and sparkling; nay, perhaps, unless a Man be a Philosopher, and in love with Contemplation, almost every thing there will appear to him to be mean, dull, and insipid: But tho' he be there depriv'd of the gawdy and noisy Pleasures of the Great, he is largely made amends by the innocent Tranquility that reigns in those charming Abodes; where nothing is heard but the Warbling of Birds, the soft Murmurs of Streams gliding thro' Meadows cover'd with Flowers, and the rustling of Leaves gently mov'd to and fro by sweet and refreshing Gales. Are we to reckon as a small Pleasure of the Country Life, the Calm and Quiet of so many raging Passions, which the tumultuous Hurry of Cities is apt to awaken in us, and whose mad and furious Transports fill the Conversations of Men with Riot and with Disorder, and discompose and ruffle all their Harmony? 'Tis the love, says Cicero, of this happy Tranquility, that in all Times, and even in our own Days, has inclin'd many to quit the Management of the Publick Affairs, that they might enjoy the Sweets of Leisure, and of Retirement. This is what we have seen done by the greatest Philosophers, and by several other Persons of excellent Merit, who governing themselves by Rules holy and severe, and being unable to suit and accommodate their Tempers to the Manners and Maxims of the common People, and of the Great, retir'd into the Country, and there plac'd the sole Pleasure of their Lives in the Conduct of their private Affairs: *Nec Populi nec Principum mores forte potuerunt: Vixeruntq; nonnulli in agris, delectati re sua familiari.* Cicero. Offic. lib. 1. If



If we look back to the Origin of things, we shall find, according to the Language of the Poets, that the Golden Age was spent, not in Cities, but in the Country, where the first, the most innocent, and the most happy of Men apply'd themselves to cultivate the Earth, no less for their Pleasure than Advantage. They who are not Strangers in the Republick of Learning, know what *Horace* has sung upon this Subject in several Places of his Poems; one of the most celebrated of which begins thus:

*Beatus ille, qui procul negotijs,
Ut prisca gens mortalium,
Paterna rura bobus exercet suis,
Solutus omni Fanore.
Nec excitatur Classico miles truci,
Nec horret iratum Mare:
Eorumque vitas, & superba civium
Potentiorum Limina.*

If we consult the sacred Historian of the Birth of Nature, we shall see that in the Beginning God planted a delicious Garden, into which he put the Man whom he had form'd.... Thus the Lord God took the Man, and put him into the Paradise of Delights, that he might till it, and keep it. Genes. chap. 2. v. 8. and 15.

Agriculture therefore was the Work to which Man was first appointed. By divine Institution his pure and innocent Hands were to be imploy'd in the Culture of the Garden of Pleasure: This Work would not have been painful to him, as at this day it is to all who dig the Ground, or who labour in Vineyards, with Toils and Hardships that are the

just Punishments of Sin. But in the first Man it would have been a Culture full of Delights, and attended with pleasing Reflections. He would have made it the Means of penetrating into the Secrets of the Greatness, and of the Wisdom of the Creator, and of drawing from thence a more exact and perfect Knowledge of things, and a deeper Insight into the Works of Nature, than any of his Descendants, however learn'd and knowing, could ever hope to attain. *Positus est homo in Paradiso, says St. Augustin, ut operaretur eum, per agriculturam non laboriosam, sed deliciosam, et mentem prudentis magna et utilia commonentem. De Genes. ad lit. lib. 2. cap. 10.*

Agriculture, adds that Saint, was not then the Punishment of a Man condemn'd to labour, but the Joy, and the Delight of a Man truly blest. He continually made it the subject of a Sublime Contemplation, suitable to the Sanctity of his Condition, and to the Elevation of his Mind. He beheld with astonishment, the secret Connexion, and the essential Relation there is between the Culture which the Plants receive upon the Earth, and the Power of the Influences which God sheds down upon them from Heaven. *De Genes. ad lit. lib. 8. cap. 8.*

Tho' all that is left us of Agriculture, if compar'd with the Beauties of that Garden, which was, in some measure, the Master-piece of the Hand of God, can give us only a very imperfect Idea of the Excellence of the Plants that Adam took Pleasure to cultivate there, before his Fall; yet the Wonders, at present, visible in the Tillage of the Earth, cease not to strike our Souls with admiration, be we but ever so little capable of comprehending such mighty things.

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And, indeed, what can be more worthy, I say not of the first Man, but even of the Angels themselves, than the Consideration of the Secrets of Nature, when we pierce through the Veils that cover them, and dive into the hidden Treasures thereof? For who is not astonish'd, says St. *Augustin*, at the secret Virtue of Seeds, and in general of whatever serves as First Principle to all the Plants; where God has inclos'd in so small a space, and in a manner so imperceptible to our senses, all the Beauties of Flowers, the whole Extent of the greatest Trees, and all the Excellence and Variety of an Infinity of Fruits. *Qui ex grano minutissimo seminis tantam ficulneae Arboris magnitudinem creat..... Denique quam multa usitata calcantur, quae considerata stupentur, sicut ipsa vis seminum?* Epist. 3. ad Volusian.

We have therefore Reason to believe, says St. *Augustin* elsewhere, that the Culture of Plants and of Trees, would have been the continual Occupation of the first Man in that Garden of Delights, in which God had plac'd him. For what can be more innocent than that Employment, for such as have Leisure enough to make it their Business; or more proper to raise up the Mind to God, for those who have a sufficient Reach of Understanding to comprehend the many Miracles that are there conceal'd under the ordinary Course of Nature? *Quid enim hoc opere innocentius vacantibus; aut quid plenius magna consideratione prudentibus?* De Genes. ad lit. lib. 8. cap. 9.

Upon which an Interpreter of the Holy Scripture makes this excellent Reflection; that if the first Man, while in a state of perfect In-

nocence, was oblig'd to work and cultivate the Earth, how much more ought we to labour, who, since his Fall, are in a State of Misery and Darkness, to which his Sin, and ours, have subjected us? 'Tis on the score of this Labour and Pennance that some pious Persons apply themselves sometimes, according to their Strength, and their Condition, to the Culture of their Gardens. VVith this sense of Mortification it is that we ought to temper and allay the extream Delight of Cultivating, with our own hands, the Plants, and the Trees, that so readily crown, with Flowers and with Fruits, the Cares and the Toils that they require of us.

It must be granted, that Men take strangely after this their first Imployment; and give as much as they can into this natural Bent and Inclination: Every one is desirous to have a Garden, and he who cannot retire into the Country, gets him one in the Town: Such as can have none on the same Level with their Dwellings, will have them in their Balconies, or on the Tops of their Houses; and if none of these VVays can be practis'd, rather than be without, they will make Gardens at their VVindows; which, the less considerable they are, are the more lively and stronger Arguments of the happy State, from whence we are fallen by Sin, and of the secret Affection, that is still lurking within us, for our first Vocation. After this, who can be astonish'd that the greatest of Men have taken Delight in Agriculture and in Gardening?

I cannot say that *Salomon* cultivated with his Royal Hands the Plants of his Gardens.

dens; but, at least, he knew them to a miracle. There never was a Naturalist so universally knowing, in Botanicks. When the sacred Text speaks of his vast Knowledge in the Nature of Vegetables, it says, *He treated of all the Trees, from the Cedar that is upon Lebanon, even to the Hyssop that springs out of the Wall,* 1 Kings 4 33.

The Holy Scripture says of *Uzziah*, King of *Judah*, who reign'd fifty two Years in great Power and Glory, that *he had Vineyards and Vine-Dressers upon the Mountains, and in Carmel; for he took much Delight in Husbandry.* *Erat quippe homo Agriculturae deditus.* 2 Chron. 26. 19.

This Occupation was not beneath a King of the People of God, and we see that the Author of the Book of *Ecclesiasticus* enjoins Labour and Agriculture as a Duty of virtuous Men: *Hate not, says Jesus the Son of Sirach, either laborious Work, or Husbandry, which the Most High has ordain'd. Non oderis laboriosa opera, & rusticationem creatam ab Altissimo.* Ecclesiastic. 7. 15.

The Kings of the East took Delight to busy themselves in the Culture of their Gardens; and made use of Instruments to turn up the Ground, with the same Hand in which they bore their Scepters. To this purpose, the History of *Esther* gives us a remarkable Passage, which evidently proves how great a value the mighty Masters of the World have always had for Agriculture. 'Tis related in the first Chapter of *Esther*, that at the end of that stately Feast, which King *Abasuerus* made for the Princes of his Court; and which lasted a hundred and fourscore Days, he order'd a Feast to be made for all the Inhabitants of *Susa*. He commanded, says the Holy Scripture, *that a Feast,*

of Seven Days should be got ready in the Entry of his Garden, and of the Grove that had been planted by the Hands of the King with Royal Magnificence. *Fussit Septem diebus convivium preparari in vestibulo horti, & nemoris, quod regio cultu et manu constum erat.* Esther. cap. 1. v. 5.

This Testimony of Holy Writ, in regard to these potent Kings of *Persia*, who planted Orchards with their own Hands, exactly agrees with what *Xenophon* tells us, to the same purpose of the younger *Cyrus*. That Historian says, that this young Prince, was not less curious to keep up the Beauty of his Gardens, than to make Peace and Plenty flourish in the Provinces under his Obedience. And 'tis acknowledg'd for a certain Truth, that the Kings of *Persia*, amidst all the Pumps and all the stately Luxury of their Courts, often apply'd themselves to the Culture of their Gardens, whenever the Duties of War oblig'd them not to be absent from their Palaces.

Pliny reckons up four Kings, that is to say, *Hiero*, *Philometor*, *Attalus* and *Archelaus*, who took particular Delight in Gardening. To these four Kings, he joins two Generals of Armies, *Xenophon* and *Mago* of *Carthage*, whose Thoughts were wholly bent on a Country Life, *Hist. Nat. lib. 18. Cap. 3.*

Seneca speaking of *Scipio the African*, says; This great Man, *The Terrour of Carthage*, had only a little Field, which he till'd himself; after the labour of Digging it, which he made his Exercise, he us'd to wash and cleanse his Body from the Sweat and Dust, and imitated the Life of the first Men. *Exercebat enim opere se, terramq; ut mos fuit priscis, subigebat, Epist. 87.*

This

This laborious way of Living trains up great Men for War. In this School, says Pliny, are brought up illustrious Generals, good Soldiers, Men of Probity, and who think no ill. *Fortissimi viri, & milites strennissimi ex agricolis gignuntur, minimeq; male cogitantes.* Hist. Nat. lib. 18. cap. 5. And, indeed, L. Quintus Cincinnatus was actually Ploughing when an Express came from the Senate, to acquaint him they had chosen him Dictator; and that too in an extreme Distress of the Common-wealth. Being arriv'd at Rome, where he was receiv'd with vast Applause, he took the Roman Ensigns, put himself at the Head of the Army, and march'd to the Enemy, who had surrounded the Consul Minutius on the Mountain *Algidus*. He defeated them intirely, and deliver'd the Consul, and the Roman Army. In acknowledgment whereof, he was honour'd with such a Crown of Gold, as 'twas the Custom to give to any who had reliev'd a Town that was besieg'd, and Triumphant Honours were decreed him at Rome. Having thus sav'd the Common-wealth, he laid down the Dictatorship, which he kept but sixteen days, and soon return'd to till his little Field, which contain'd but four Acres. *Dictaturam deposuit, says Livy, & ad Agram reversus est.*

If we may credit some eminent learned Men, we must believe, that the most illustrious Families of the Roman Common-wealth, were descended from Herdsmen, Ploughmen and Gardeners; and from Gardeners too, of the lowest Rank, who cultivated only Kitchen-Gardens. Thus the *Piso's* took their Name from the Peas they cultivated, and *Lentulus* had

had his from the *Lentils*, which his Family us'd to sow. *Fabius* came from Ancestors, who, in spite of *Pythagoras*, would eat their fill of Beans. *Cicero* was so call'd from the Chick-Pease, his Predecessors cultivated in their Gardens; and *Lactucinus* from the Lettuce. As for *Hortensius*, 'tis very likely he was born of some Gardiner. The Family of *Stolo* owe their Extraction to Vine-dressers, to Men, whose Business it was to prune Vines. According to this Rule, *Porcius* must have been the Son of a Swincherd. The Father of *Ovinus* kept the Sheep; *Bubuleus*, the Oxen; *Vitulus*, the Calves; *Caprilus*, the Goats. Thus argues word for word *Alexander ab Alexandro*, lib. 18. cap. 19. But the learned Abbot *Lancelotti*, will not allow these Derivations to be well grounded. What makes for the former is, that he speaks only after *Pliny*, who first publish'd this sort of Etymologies.

But if it be not true, that the most illustrious Families of the *Romans*, took their Names from the Plants which they Cultivated, preferably to all others; 'tis at least certain, that some Persons of Renown, and even of the first Rank, have given their Names to some Plants, whose particular Virtues they first of all discover'd. The Botanists tell us, that *Mercury* gave his Name to the Plant so call'd, and was the first who brought it into Vogue. That the Centaur *Chiron*, first taught us the Virtues of Centory. That *Achilles*, the Pupil of *Chiron*, render'd famous the Herb *Milfoil*, which the *Greeks* call *Achillea*, because *Achilles* made use of this wonderful vulnerary Plant, to heal the Wound of *Telephus* King of *Mysia*. That *Telephus* himself gave

gave *Telephium*, (Wild Purslain) its Name and Reputation. That *Artemisia*, Wife of *Mausolus*, King of *Caria*, gave its Name to the Plant *Motherwort*, which the *Greeks* and *Latins* call *Artemisia*. That *Gentius*, King of *Illyria*, discover'd the Virtues of *Gentian*. That *Lyfimachus*, Son of *Agathocles*, brought into use the Herb *Loosestrife*, (*Lyfimachia*) whose Virtues are so highly prais'd by the Botanists. That *Eupator*, King of *Pontus*, took care to cultivate *Liverwort*, which is call'd *Eupatorium*.

Tho' the scorching Climates of *Africa*, are not Soils proper for Gardens, yet *Massinissa*, King of *Numidia*, joining Art and Labour to Nature, made himself such Gardens, as History will never cease to celebrate: He had so violent an Affection for Trees, that the Care he took of them surmounted the Dryness of the Soil, insomuch that they bore Fruits which till then, were thought destin'd only for more temperate Regions, and for milder and more favourable Climates. The *Africans* themselves were amaz'd to see Fruits growing among them, to whose very Names, they, till then, were Strangers.

Who is so dull, as not to be mov'd with the Pleasures that are inseparable from a Country Life. *Alfredius* says it is a Sea, an Ocean of Satisfaction and Delights. *Hæc vita est Mare quoddam delectationis ac jucunditatis*. *Encyclopæd. lib. 17. cap. 6.* How charming is it, to behold the Meadows shining with a lively Green, and enamell'd with an Infinity of Flowers! A fertile Field crown'd with Golden Ears of Corn; the Hills adorn'd with Vines, loaded with Clusters, that promise Rivers of Wine

Wine sweeter than Nectar! The hollow Vales, resounding with the Conforts of Shepherds, who innocently chant their Lays, while their frisking Flocks crop the Grass among the Flowers! A Ploughman returning home in the Evening with his Plough and his Oxen, weary'd with the labour of the Day, and who soon finds in Repose and quiet, the forgetfulness of his past Toils! The diligent and industrious Bees come back to their Hives, loaded with a Balsamick Juice, which they have plunder'd from the Flowers, and of which they compose their Honey. At length the Night o'erspreads the Earth with Darknes, and then all Cares vanish away: A powerful Charm fetters all Nature in Silence, and in a soft Inchantment. *Virgil*, calling to mind these quiet and innocent Delights, cries out! O ye happy Mortals, who make your Abodes on the Hills, and in the Vallies, and who, far from the Noise of Armies, cultivate your fruitful Fields! Nothing can be wanting to compleat your Happiness; except perhaps the sole Pleasure of knowing the Felicity of your Condition.

*O fortunatus nimium, sua si bona norint,
Agricolae! quibus ipsa, procul discordibus Armis,
Fundit humo facilem victum, justissima Tellus.*

Georg. lib. 2.

Where, for Eighty Verses together, he goes on, giving a charming Description of a Country-Life.

Claudian represents very well, the quiet and easy Days of a Man, who attains to a good old Age, in the same place where he was born, with-

without having ever intermeddled in the publick Affairs; and whom the Frensy of Travel-
ling never carry'd into Foreign Lands,

*Felix qui propriis ævum tranſegit in arvis;
Ipsa domus puerum quem vidit, ipsa ſenem.
Qui baculo nitens, in qua reptavit arena
Unius numerat ſecula longa caſæ.*

Seneca, the Tragedian, paints in a moving manner, the quiet Freedom and inestimable Security they enjoy, who live far from Cities.

*Non alia magis eſt libera, et vitio carens,
Ritusque melius vita quæ priſcos colat,
Quamquæ relictis mœnibus campos amat.
Non illam avaræ mentis inflammat furor;
Non aura populi, & vulgus infidum bonis;
Non peſtilens Invidia, non fragillis ſavor;
Non ille regno ſervit, aut regno imminens
Vanos honores ſequitur, aut fluxas opes,
Spei metusque liber.* Hippolit.

When Alexander ſaw Diogenes in his Tub, and ſaw him ſo content, he could not forbear ſaying of him, that he was wiſe, great and happy, and that he thought himſelf to have but little Senſe and Underſtanding, becauſe he could not lodge at his eaſe in a leſs Houſe than the Univerſe. Hear how Juvenal ſays this after his Manner;

*Senſit Alexander, teſta cum vidit in illa
Magnum habitatorem; quanto felicitior hic qui
Nil cuperet, quam qui totum ſibi poſceret Orbem.*
Sat. 14.

If

If the advice of *Persius* were to be follow'd, many would forsake their gilded Roofs, to retire and live on Chesnuts at their Father's Farm. This is almost what that Poet says: He retrenches all the Kitchen-Goods to a Kettle; which, is indeed, too rigid, and few can bring themselves to it.

—————*Rura paterno*
Est tibi far medicum; purum, & sine lake salinum;
Quid metuas? cultriq; feci secura patella est.
Hoc satis est.————— Sat. 3.

Before we enter on the Praises which our modern Authors have given us of a Country Life, let us hear *Cicero's* Opinion of it. He above all others deserves the Title of the Panegyrist of a retir'd Life, especially if led in the Country. To collect all the Passages of that most Judicious Author on this Subject, were to compose a Volume. That Father of the *Roman* Eloquence, who always had a hand in the most important Affairs, and was ever conversant with the greatest Men of the Republick, was not ignorant of all the specious Allurements that either the Town, or the Court, could offer to tempt us; he consider'd nevertheless all those glaring and dazzling Objects, but as so many Trifles, in comparison of the innocent Pleasures Men enjoy in an Honourable Retirement in the Country. 'Tis not safe to hear that Orator on this Subject. His lively Colourings win the Hearts, even of them who are most fond of a Town-Life. He is able to Metamorphose the Country into the City, and the City into the Coun-

Country, for who can hold out against the moving Descriptions he gives us of rural Pleasures. Under his Pen *Laelius* and *Scipio* made no ill Figure, when they left *Rome* to go into Country. I have heard, ['tis *Cicero* makes *Cras- sus* speak it] that *Laelius* was almost always wont to go into the Country with *Scipio*, where they us'd to divert themselves with Boyish Recreations, in a manner scarce to be believ'd, whenever they escap'd from the City, as from a Prison, and got away into the Country. I dare not say of so great Men; but *Scævula* us'd to tell it of them, that at *Caieta* and *Laurentum*, they amus'd themselves with picking up Shells on the Sea-shore, and play'd together like Children. The Text of *Cicero* is stronger, and more full than my Translation: I will therefore transcribe it for the satisfaction of such as understand the Beauty of the Latin Tongue. *Audivi — Lælium semper fere cum Scipione solitum rusticari, eosq; incredibiliter repuerascent esse solitos, cum rus ex urbe, tanquam evinculis, evolvissent. Non audeo dicere de talibus viris, sed tamen ita solet narrare Scævula, conchas eos & umbilicos ad Caietam & ad Laurentum legere consueisse, & ad omnem animi remissionem Ludumq; descendere.*

Among a hundred excellent Passages of *Cicero*, I will chuse out but two or three more. The first from his second Oration for *Sextus Roscius Amerinus*, who was accus'd for having kill'd his Father. *Erucius*, who pleaded against him for the Prosecutors, said, that this *Sextus Roscius* might perhaps have taken Offence, that his Father kept him always in the Country, to make the best of his Lands, &c. *Cicero* gives another Turn to that Conjecture, over-powers that

Advo-

Advocate with many solid Reasons, taken from the value that has always been set on a Country Life; and proves that what *Erucius* takes for a Banishment, was, indeed, a certain Proof of the sincere Affection of the Father for the Son. Our Ancestors, says he, us'd not your Expressions, when they spoke of Husbandry. The favourite Children were brought up to it by their Parents. What would you have said, when Husband-men were taken from the Plough, to be made Consuls? *Atilius* was sowing his Corn, when he was sent for to Rome, to be honour'd with the Consulship. From Men like him came the greatness of the Republick, and the Majesty of the Roman Name; and what you take for an obscure and contemptible Life, is an honourable and delightful Profession. *Vitamque hanc rusticam, quam tu probro, & crimini putas esse oportere, & honestissimam & suavissimam esse arbitrantur;*

Cicero goes yet farther, and in his Book *de Senectute*. affirms, that the Pleasures which pure and uncorrupted Nature has allotted for Husbandmen, are the very same that suit best with a Philosopher, and a Man truly wise. In that Treatise he has muster'd up all the strength of his Erudition and Eloquence, to praise a Country Life. His Arguments are not so much the Effect of Study, as of his Liking and Opinion, as he himself declares, beginning by these Words; I come now to the Pleasures of Husband-men, with which I am incredibly delighted. *Venio nunc ad voluptates agricolarum, quibus ego incredibiliter delector; quæ nulla impediuntur senectate, & mihi ad sapientis vitam proxime videntur accedere.* He goes on, and par-

ticu-

particularly describes the Household, the Games and Diversions, the manner of Eating, and all the Pleasures of the Country. There, says he, we take delight to see our Grapes ripen. We walk in our Gardens; we graft our Trees; we get in our Corn, that it may not become a Prey to Birds; we admire our Bees; we taste our Wine. We go into our Yards to see our Poultry and our Cattle: We talk of Natural Philosophy, and dispute concerning the Force of a small Seed, that unfolding and opening it self in the Earth, produces so great a Tree. I wonder not, continues *Cicero*, that so many great Men have voluntarily abdicated the Grandeurs of the Government, to devote themselves to Agriculture: Nor that *L. Quintius Cincinnatus* was working at his Plough, when News was brought him, that he was created Dictator. The Country Life is pleasant, if a Man takes Care to provide himself with Necessaries in their due Season. *Cicero* requires that the Bacon, the Poultry, the Lambs, the Kids, the Milk, the Cheese, the Honey, the Olives, a Cellar well stor'd, the Fruit, and the like, continually employ the Thoughts of the Person who takes care of House-keeping. He declines all laborious Games and Exercises, and seems to be of Opinion that old Men should play only at *Chefs* and at *Tric-trae*. After this he cries out, I will pass my declining days in the Country; for no where else can old Age be happy, as I could make appear by a hundred other Pleasures of the rural Life, but I perceive I have been too long already: Excuse me, for I speak of the Country thro' Inclination and Affection: besides, I am not Young; and old Men, you know, are apt

to be wordy. *Possum persequi multa oblectamenta rerum rusticarum; sed ea ipsa, quæ dixi, sentio fuisse longiora: Ignoscetis autem: Nam & studio rerum rusticarum provectus sum, et senectus est natura loquacior ne ab omnibus eam vitiiis videar vindicare.*

What we say here of Agriculture in relation to all sorts of Degrees and Conditions of Men, is not with Design to send all Men to the Plough, and to make them till the Earth, as *Attilius* and *Cincinnatus* did among the antient Romans; nor to engage them to spread Dung on a Field to fatten and manure it, as do most of the Kings whom *Homer* celebrates. Men rise not now adays from the Plough to the Sceptre, nor return from Triumph to Digging. The *rusticari* of *Lælius* and of *Scipio* signifies now to take the Diversions of the Country, for the Refreshment of the Mind: And whatever is toilsom in the rural OEconomy, is perform'd by those, whom Necessity has reduc'd to labour. No man takes more of it upon himself than his Degree, his Condition, his Age, his strength, and Decency, will permit him. Nevertheless a Country Life ought not to be spent in a dull and lazy Inactivity. There are some Duties incumbent on it, especially among us Christians, whose Recreations are bounded in a narrow Room. Therefore all we have said, or are to say concerning the Pleasures of this Life, ought not to be literally taken, as we find it in the profane Authors, who labour'd after an earthly Happiness, which the Law of Evangelical Mortification forbids to a sinful Man. We speak of the quiet Pleasures of a Country Life in opposition to the tumultuous Hurry and Difficulties, which the different Passions of Men stir up in Cities.

Cities. A Country Life is more proper for Recollection and Contemplation. We continually see before our Eyes a thousand wonderful Objects; that are most proper to raise up the Mind to God. Besides, Philosophy and the Study of Nature nourish Piety, and support Religion, but we are lost in the Noise of Cities, e'er we are aware of it. There we are drawn away by the same Trifles, with which those Wordlings are taken up, who never reflect on the Nothingness of temporal things, or on what is to be hop'd for or fear'd in a future Life. The wise Heathens complain'd of the Blindness of Men, whose Hearts were set on Trifles, that brought them into so many and so great Inconveniences. In this sense it is that we are more Masters of our Passions, when we are remov'd from Cities; and that a Country Abode has more of Innocence and Tranquillity. Upon this Subject we have an admirable Letter, that the younger *Pliny* writ to one of his Friends, to whom he justifies himself for his retreating to his House at *Laurentum*. He concludes it, by exhorting that Friend to quit the Town likewise. The Trifles that busy the Great Men of the City and of the Court, can not be better describ'd. The whole Letter is an Original in its Kind. *'Tis a wonderful thing, says he, to see how the time is spent at Rome. Consider each day apart, and there is not one but is full of Business. Put them all together, and you are surprized to find there was so little to do. Ask any one, what have you been doing to day? He will tell you, I have been at the Ceremony of the Tago Virilis, that such a Man gave his Son. I was desired to be present when such a Party which was*

betroth'd to another. I have been at a Wedding, or
 present at the making a Will. A Friend spoke to
 me to solicit an Affair. Such a one sent to consult
 with me. Each of these things seem'd requisite,
 when we did them: All of them together seem to
 no purpose; nay more, when you reflect on them in
 Solitude and Retirement, you can not but say to your
 self; How have I trifled away my time? This I
 am continually repeating to my self at my Seat at
 Laurentum, whether I read, whether I write, or
 whether I leave my Study to give some Exercise to
 my Body, whose Disposition has so great an Influence
 on the Operations of the Mind. In this Place I nei-
 ther hear nor see any thing, that I repent to have
 heard or seen. No Man here speaks ill of me, to
 make others my Enemies. I find fault with none but
 my self, when what I compose does not please me.
 Here void of Desires and Fears, and free from the
 Stings of Satire, nothing disturbs me. I converse
 only with my self, and my Books. O Life, both In-
 nocent and Delightful! How lovely is this Leisure,
 how honourable, and preferable even to the most
 illustrious Employments! O Sea! O Shores! Whom
 I make my Study, with what noble and happy
 Thoughts do you inspire me? Take my Word, my
 dear Fondanus, shake off the Fetters of the frivo-
 lous Cares that wed you to the Town; apply your
 self to Study, and to Quiet, and be persuaded that the
 excellent saying of our Friend Attilius is but, alas!
 too true: 'Tis infinitely better to do nothing,
 than to waste our time in Trifles. *Satius est
 enim otiosum esse, quam nihil agere.* Lib. 1. Epist. 9.

It may be thought perhaps that this was the
 Opinion of the Antients, and that the Learned
 of our Days think and speak otherwise. But
 sound Judgment is found Judgment in all Ages;
 and

and the modern Authors have declared themselves in favour of a Country Life, no less than the Antients.

Justus Lipsius proves to one of his Friends that the Life men lead in the Country, is infinitely preferable to living in the Town; whether we consider it in relation to Philosophy, to good Manners, or to true Happiness; and even that it has the Advantage over it on account of Riches. *Agrum, & in eo cultum, meliorem urbe esse aio; ad sapientiam, ad mores, ad voluptatem, adde & fructum.* Cent. i. Epist. 8.

Nicholas de Clemengis, Archbishop of Bayeux, compos'd fourty three Hexameter Verses in Praise of a Country Life. They shew us that this learned Prelate, how rigid and severe soever he were, was not always out of humour, and that he ceas'd sometimes to declaim against the Abuses and Disorders of the Age in which he liv'd. He forgets not the good Milk, the fresh Butter, and the excellent Cheese of his Hamlet. He has indeed but copy'd after one *Ganterus*, who retir'd with his *Helena* to his little Farm, which he would not have chang'd for a real Palace, tho' beautiful as the enchanted Palaces of Romances. What he calls a Courtier he uses something roughly, and extols to the Skies the Merit of his Countryman. His last six Verses run thus.

*Me labor intus alit cum libertate jocosa,
Ipse Helenam securus amo, meque illa vicissim.
Hoc satis est; pompas tumuli aspernamur inanes.
Tales fundebat voces Gonterus: ut illas
Accepi exclamo; baud servus valet aulicus assem;
Æquat sed liber gemmam Gonterus in auro.*

Dom Guevara, Bishop of *Mendonado*, and Historiographer to the Emperor *Charles V.* whose Court he follow'd, often bemoans his misfortune, that he could not attain to the Happiness of shutting himself up in a quiet retirement. He speaks as much in praise of a Country Life, as he declaims against a Court Life. To an Abbot, who was grown weary of residing at his Abbey, and whose time lay upon his Hands, he writes to this purpose. There are, says he, but two sorts of Men that do well at Court; the Favourites, who largely find their Account; and the young Men, who know not what the Court is. Believe me, every one is tir'd with being here, but the Court enervates our Resolution to that degree, that tho' all of us resolve not to end our Days here, not one of us can go hence. If any Disgrace happen to drive any one away, he is never at rest till he get back again, and even they who Affairs oblige them to reside elsewhere, are most fond of living here. Continue therefore where you are; for you will not be long here, e'er you wish your self again in your Solitude at *Monferrat*. And in a Letter to *Don Francisco Cobos*, after having made a Parallel between the Sea and the Court, he concludes with telling him. Trust but little to the Sea, and not at all to the Court. These two things are beauteous to behold from far, and 'tis better to be a Spectator of them, than an Actor there.

I should never have done, should I here repeat all the fine things have been said of Agriculture, and in Praise of a retir'd Life. They who have a liking to that sort of Compositions, may have recourse to *Dornavius* in his
Amphi-

Amphitheatrum Sapiensiae Socraticae jocosae, where he has collected seventy four Pieces, all of them in Praise of a Country Life, some of which are excellent. The *Comes Rusticus* of M. Pelletier, Minister of State, is a Collection of all that is fine on that Subject. That great Man, by voluntarily resigning all the Splendor and Greatness that Fortune could bestow on any Man below the Dignity of a Sovereign, has fully prov'd, that there are yet some wise Men in the World, who know to value each thing according to its Worth. The King, when that Minister ask'd his Leave to retire, made use of an Expression, that shews the Opinion his Majesty had of that honourable Retreat, and his Thoughts concerning the Court. When he was going out of the Room, the King look'd after him and said: *There are but few here capable of doing like Pelletier.*

Our Authors, particularly our Poets, have not been more silent than our Neighbours in the Praise of Agriculture: But their Works being in most men's hands, 'tis needless to swell this Volume with them.

But while we are praising a Country Life, and advising to retire from Town, we may not forget to take Notice that there are three sorts of Solitude: a Solitude of Beasts, which is shameful and wholly to be condemn'd; a Solitude of Philosophers, which is very much to be suspected; and a Solitude of Christians, which is the only Solitude worthy of Praise.

Theirs is the Solitude of Beasts who go into the Country to eat, drink, sleep, and play away their Time; and who give no Token of Life,
 C 4 except

except only of a Life wholly animal and sensual.

The Solitude of Philosophers is the Solitude of a contemplative Man, who attentively and seriously considers all the Works of Nature in the different Seasons of the Year. The Heavens, the Earth, and the Sea, are the successive Objects of his Reflections. He admires the eternal Succession of Night and Day, and the never failing Changes of the Seasons. He sees the Sun rise every Morning and mount the Horizon, and go down every Evening into the other Hemisphere. The Fountains, the Meadows, the Mountains, the Valleys, the Forests, a Field of Corn, that bends beneath a plentiful Crop, the Beasts of the Earth, the Air that resounds with the Warbling of Birds, a Shadow of a Voice that rebounds from a neighbouring Echo ; each of these has its Charms, and falls under the Cognizance of a Philosopher: But if he stop at the bare Contemplation ; if he be satisfy'd with adoring the Works of Nature ; if he raise not up his Thoughts to the Author of all these Wonders ; if he join not in Consort with all the Creatures to praise their common God, he falls short of his Duty. *Seneca* expressly condemns this unactive Speculation. After having said that men were plac'd in the World to contemplate the great Object of the Universe ; and to be the Witnesses and Admirers of all the Wonders that are acted there, he adds, that he ought not to stop there neither, and that Nature has form'd us no less for Action than for Speculation. *Hæc qui contemplatur, quid Deo præstat ? ne tanta ejus opera sine testa*

testa sint—— *Natura nos ad utirumq; genuit, & contemplationi rerum & actioni. De otio sapient.*

If this be the Language of a Heathen to other Heathens, what ought we to think of the Obligations of a Christian in Retirement?

The Solitude of a Christian ought to go farther: its Duties are more extensive and urgent. *Pliny* in the Darkeness of Paganism could say, that a wise Man ought not to regard the Beauty of Flowers without reflecting at the same time on their Fragility and small Duration, and that their transitory Charms are but so many Admonitions to us, that we ought to seek after a never-fading and eternal Beauty: *Flores, odores quos in diem gignit natura, magna ut palam est, admonitione hominum, quæ spectatissime floreant, celerime marcescere. Hist. Nat. lib. 21. cap. 1.* This excellent Passage is not unworthy of the Sanctity of the Christian Religion. But to conclude this Chapter let us learn from *St. Augustin* the true Use we ought to make of Retirement. The Idea we ought to form to ourselves of it, are contain'd in the following Rules. *We ought not, says he, so to abandon ourselves to contemplation, as to have no regard to the Advantage of our Neighbour; nor to give ourselves up wholly to an active Life, so as quite to forget Contemplation. In our Retirement we ought not to love Idleness, but imploy ourselves in the search of Truth, to make our own Advantage of that Knowledge, and not to envy it to others; and in the active Life, we ought not to seek after Honour and Power, because 'tis all but Vanity; but we ought to love Labour, when it contributes to the Salvation of such as are under our Care. Nec sic quisque debet esse otiosus, ut in eodem otio utilitatem non*

non cogitet proximi: nec sic actuosus, ut Contemplationem non requirat Dei. In otio non iners vacatio delectare debet, sed inquisitio aut inventio veritatis; ut in ea quisque proficiat, & quod invenerit teneat, & alteri non invideat. In actione vero non amandus est honor in hac vita, sive Potentia; quoniam omnia vana sub sole: sed opus ipsum—— ut valeat ad eam salutem Subditorum, quæ secundum Deum est. De Civitat. Dei lib. 19. cap. 19.

CHAP. II.

*The Anatomy of Plants, according to the
• Modern Naturalists.*

THE Structure of Plants deserves no less the Attention of Philosophers, than the Structure of Animals. Nature is wonderful in every thing, but particularly in the Formation of Vegetables. That may be call'd the Reign of its Miracles; and the Reason why fewer Curiosities have hitherto been discover'd in the Anatomy of Plants, than in the Dissection of Animals, is because Men have apply'd themselves less to it.

Galen believ'd he had prais'd to the highest Degree the Author of Nature, by describing the Use of the several Parts of Animals; *Galen. de usu Part. lib. 3.* and I am of Opinion that they who first discover'd the Use of the Parts of Plants, have not less celebrated the Power and the Wisdom of God. When we consider their wonderful Construction, we are forc'd to cry out with the most eloquent of the Prophets: This

This is the Work of Lord, the God of Armies, that he might make known the Wonders of his Wisdom, and magnifie his Justice. *Et hoc a Domino Deo Exercituum exiit, ut mirabile faceret Consilium, & magnificaret Justitiam.* Isaïas, cap. 28. v. ult. It must be confess'd that the Antients knew but little of it, and that we are much oblig'd to the Helps we have receiv'd from the Microscope, whose use has been but lately discover'd : for the Naturalists who were not aided by that Machine, could have no great insight into the Contexture of Plants; whose structure is an Organization compos'd of Fibres so small, of Particles so slender, of Vessels so narrow, and of Pores so strait, that a naked and unassisted Eye can never arrive to discover them. Nay, how many things has Nature plac'd even above the Reach of the Microscope, and into which the sight of Man can never penetrate.

By the Word *Anatomy* we mean in this Place a Science that teaches us to know the Parts of a Plant by Dissection, and with the Help of a Microscope.

A Plant is a living Body without Sense, annex'd to a certain Place where it vegetates; that is to say, where it nourishes itself, shoots, increases in size, and produces Leaves, Flowers, and Seeds, or Fruits furnish'd with Seeds.

OBSERVATIONS.

1. **B**Y saying that a Plant is a living Body, I mean, that it contains within itself a Principle of Life, which we may call *Soul*; from whence proceed the Operations of each Plant, which

which are Nutrition, Augmentation and Propagation: these three things we shall sometimes express by the single Word *Vegetation*, which in Effect includes them all.

'Tis reasonable, in my Opinion, to acknowledge a Soul and a Life in Plants; because we see by the things that happen in the Course of their Duration, that they contribute very much of themselves to their Nourishment and Preservation; and this the Minerals, which we call *Inanimate Bodies*, do not; because they afford nothing of themselves to their Nourishment and Growth.

But tho' we allow Plants to have a *Life* and a *Soul*, we declare our Opinion to be, that this *Soul*, or this *Life* consists only in the Order and in the Construction of their essential or organical Parts, and in a certain Disposition of their Pores; which is the cause that the Moistures of the Earth find an Entrance into them, and distribute themselves there in a manner, proper to nourish the Plants of each Kind.

Had *Campanella* given only to Plants this mechanical Soul, *Du-Val*, a Doctor of the Faculty of *Paris*, might be said to have declaim'd against him with too much Violence; and indeed, he seems to make him say things he never meant, oniy to have the Pleasure of railing at him. I know that *Campanella*, lib. 3. de *sensu rerum*, cap. 14. allows Sense to Plants as well as to Beasts, and even calls them *animalia immobilia*, immoveable Animals: but I could never see in any Place of his Works, that he ever said that Plants were capable of Reason and of Understanding; as the *Manichees* believ'd

hev'd them to be : nevertheless *Du-Val* accuses him of it.

2. What *Campanella* advances concerning the Sympathy and the Antipathy of Plants, some of which are fond, and the others hate one another, is no Proof that Vegetables and Animals compose but one Race ; nor that Plants are inclin'd with Sense : besides, this Sympathy and Antipathy of Humours and Inclinations in Plants are meer Visions : and the Belief of them is a Rag of the *Peripatetick* Philosophy, which *Campanella* had not abjur'd when he declar'd War against *Aristotle*.

After having explain'd the Definition we have given of Plants in general, we must give notice, that under the Name of Plants, we include *Trees, Shrubs, Under shrubs, and all sorts of Herbs.*

There are some Vegetations that are not contain'd in our Definition as all the sorts of Mushrooms and Mosses : the maritime Vegetations, as all sorts of Coral, Corolloides, Sea-Palm, Sea-Feather, and the like, which indeed are not properly Plants, and *Ray* speaks of them, but as of imperfect Plants, tho' they must be allow'd to belong to the Race of Vegetables ; supposing they receive their Nourishment by *Intus-susception*, and that they grow not like Stones, by *Fuxta-Position*.

The Division of Plants into their several Kinds and Sorts, and to treat of them under several Classes and Chapters being of no use in order to the Understanding of the Mechanical Operations of Nature in their Vegetation, and regarding only the Botanists, we will leave

to them a trouble that can be of no service to our present purpose.

But that we may proceed with Order in the Anatomy of Plants, we must consider each Part of them one after the other; and those Parts are not all at the same time in a Plant, but are form'd successively to one another: for Plants have not Flowers and Fruits the first Days of their Growth. The Flowers are under the Jurisdiction of *Flora*, who reigns in the Spring; and the Fruits belong to *Pomona*, to whom the Autumn is consecrated.

We will therefore begin with the Seed of a Plant, and not leave it till we have brought it to bear Seed itself. From one Extremity of this Interval to the other, we reckon eight different things: 1. The Seed; 2. the Root; 3. the Stem; 4. the Buds; 5. the Branches; 6. the Leaves; 7. the Flowers; 8. the Fruit: of each of which we are going to speak in the following Articles.

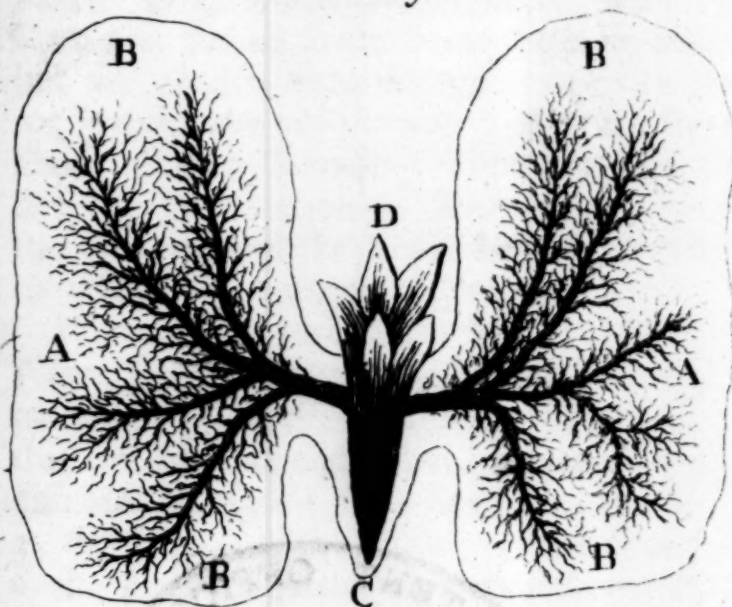
ARTICLE I.

The Seed.

THE Seed is that which the Plants produce for the Propagation, and for the Continuation of their Kind; and there are as many sorts of Seeds, as kinds of Plants. The shape and the size of Seeds vary according to their Kinds; and what surpasses our Reason is that large Plants often bear the smallest Seeds. Thus there is no Proportion between the Seed and the Plant it produces. The Seed of Tobacco is very small: a common Bean is three hundred



A Bean dissected



AA. The two Lobes.

BBBB. The Parenchyma.

C. The Radicle.

D. The Plumule.

CD. The young Plant.



hundred times as big; and yet the Plant it Produces is much less than a Plant of Tobacco.

'Twere endless to take a view of all the Sorts of Seeds; we will therefore confine our Anatomy to one: for tho' all Seeds resemble not one another in several things, yet there is always some Analogy between them. We will pitch upon the Dissection of a large Bean, because all its Parts are more sensible, and more easy to be observ'd and known.

A Bean is cloath'd with two Skins, that are easily divided while the Bean is yet green. These two Skins compose what we call the Rind. The first or outmost Skin is called the *Cuticle*; the second or inmost Skin is called the *Paronchyma*.

At the thickest end of the Bean, there is in the outmost Skin a little Hole, fit for the Point of a Needle: and all Seeds, whose Skins are hard and thick, are pierc'd in like manner; tho' the Hole in some of them cannot be seen without a Microscope.

The two Skins being taken off, we find the Body of the Bean, which is always divided into two *Lobes*. There are no *Lobes* in Corn, but the Seed of Cresses has three.

Towards the bottom of the Bean we discover a small Organical Body, whose lowermost part is called *Radicle*; because 'tis the Origin of the Root. The uppermost Part is called *Plume*, and from thence shoots the Stem: The *Radicle* is likewise called the *feminal Root*.

The little Hole it is pierc'd for the Entrance of some succulent aqueous Parts, as may excite the Fermentation that is absolutely requisite

requisite for the Germination of the Seed: that is to say, to the end that the *Radicle* and the *Plume* may unfold and dilate themselves. The *Radicle* shews itself first, and is already grown to be a *Root*, when the *Plume* but begins to lengthen and shoot out, in order to form itself into a *Stem*.

Dr. *Grew*, whom we have hitherto follow'd, will not take it amiss if we dissent from what he adds concerning the Germination of a Bean, when he says that the two Lobes convert themselves into two Leaves. The first Figure at the end of his Book shews quite the contrary. The Leaves spring from the *Plume*, as fast as that lengthens and unfolds itself.

Let us now consult the Authors, who by the help of the Microscope have made new discoveries in the Anatomy of Plants. I believe nothing can be added to what M. *Leeuwenhoek*, one of the Royal Society of *England*, has said upon that Subject in his learned Letters, intitled, *Arcana Naturæ*.

This indefatigable Virtuoso has found out, that the Plant is intire in several sorts of Seeds, and may be specifically discern'd in each them. The Leaves and the Root are there in a distinct, not confus'd Situation. One Seed, says he often, is a whole Plant in little: 'tis a Miniature that contains the whole. But let us hear his own Words. He explains himself on this Subject like a Man, charm'd with the Beauties of his Discoveries.

There are Seeds, says he, in which we discover even more distinctly than in an Acorn or a Filberd, the Plants fully form'd with their Leaves, their Stem and their Root: whereby we see that wise Nature

Nature observe a like mechanick Order in all her Works. Each Grain not only contains in itself a Plant that is to spring from it; but likewise a white substance which we call FARINA, [Meal] to nourish the new-born Plant, till it come to have a Root, capable to feed it with the Moistures of the Earth. Besides this farinaceous Matter, there is, an oily Humour, to support for a long time in the Seed, the Principle of Life, that animates the little concentr'd Plant, which without this vivifying Oil, without this balsamick Juice, would dry away and perish. O the unspeakable Power and Wisdom of God! There is no distinction of Sex in Plants, as there is among Animals, whose Propagation is continu'd by the mutual Help of both Sexes? 'Twas therefore necessary that for the Generation of Plants, the Author of Nature should shut up in each Seed for the benefit of the young Plant, whatever the Animals in their Formation receive from the Father and the Mother. Excepting that the Plant only by producing its Seed performs the Functions of both Sexes, the same Analogy, the same Order, and the same Wisdom reigns throughout in both. The Animals that owe their Origin to a Father, find their nourishment in the Womb of a Mother; and this nourishment is believ'd to be imparted to them by the Navel-string. In the Bean we were speaking of, this little Embryo of a Plant is fasten'd by a small Ligament to the two Lobes, from whence it derives its nourishment. [Thus you see the use of the Lobes, which change not into Leaves as Grew believed.] When the Animal is born, the Vessel that supply'd it with nourishment breaks and dries away. When the little Plant has burst its way thro' the two Skins that infolded it together with the two Lobes;

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when

when its Root and its Stem have forc'd their Passage, the slender Ligament by which it receiv'd its nourishment in the Womb of the Seed, breaks, dries up, and the exhausted Lobes grows rotten.

This Analogy between the Formation of a Plant, and the Formation of an Animal, is yet more distinctly visible if we compare a Grain of Seed with a Birds Egg. VVhat the Cock and the Hen furnish to the Egg, the Plant alone supplies to the Seed, which is nothing else but the Egg of a Plant. But seeing the Plants have no local or progressive Motion, and cannot go to one another, as the Fish, the Birds, the Animals of the Earth, the Reptiles and Insects do, the Plant must bestow on each Seed the Fecundity, that comes from the Father, and the nourishment that the Mother affords. The Poets, who held that their Gods were of both Sexes, would have had more reason to have said so of Plants and of Trees.

Leeuwenboek, in another Place, compares the Propagation of Plants with that of Fish; Fish have Eggs, and Plants have Seeds, which are indeed their Eggs. There is, says he, a perfect Relation and Analogy between them, except that each Plant must perform the Functions both of the Male and Female.

Then he adds, that from all these Observations we ought to conclude, that the most merciful God, the Almighty and most wise Architect of the vast Frame of the Universe produces no more any new Plants, nor any new Creatures: but that having bestow'd on those he at first created, as much Fruitfulness as he thought fit, he impregnated them with all the Plants, and with all the Animals, that were to be born in the Succession of all Ages. Thus the Plants that are produc'd each Spring, are as anti-
ent

ent as the World. I say the same thing too of Animals: for their young are contain'd in the Matter, that fills the Seminal Vessels of the Males: and what we call Generation, is but the Producing and Manifestation of an Animal, that God had form'd a few days after the Creation of the Sun, the Moon, and the Stars. *Ex hisce Observationibus certi esse possumus, Deum optimum maximum, sapientissimum hujus Universi opificem, nullas novas producere creaturas, sed eum ab initio omnia ordinasse, ac fecisse, ut omnia rite facta, ac adulta Plantarum semina, licet oculis nostris occultum, sit mansurum, sibi jam ingenitam habeant, vel in se contineant, eam materiam, quæ principium est ejus Corporis, quod suo tempore ex iis est nasciturum, ac per omnia convenit cum corpore, unde originem suam trahit. Quod ut in Plantis fit, ita pro certo habeo, necessario etiam in seminibus masculinis omnium animalium locum habere.* Epist. 64. ad Regiam Societat. Londinens. pag. 159. Tom. 1.

Can any thing be more worthy our Thoughts than these Reflections, that lead a Man of sound Reason from Philosophy to Religion? Who can behold so many Miracles, contain'd in the smallest Grain of Seed, without confessing that this wonderful OEconomy for the Propagation of Plants and of Animals can not be the Work of the fortuitous meeting of Atoms, but that on the contrary, a Cause infinitely powerful and wise, did at first appoint, and still governs this Order and Disposition.

The Fruitfulness of some Plants is wonderful. Grew says, that the White Poppy yields thirty two Thousand Seeds: but he made his Computation on this Supposition, that this

Poppy produces only four Heads ; whereas in a kindly Soil it will produce even twelve ; and then by augmenting proportionably the Quantity of its Seeds, we shall find on one Stalk of Poppy no less than ninety six Thousand. How surprizing soever this great increase may seem ; yet the White Poppy comes not near the Tobacco in Fruitfulness. *Ray*, in his *Hist. Plantar. lib. 1. cap. 12. pag. 24.* tells us, that he has observ'd that one Tobacco Seed produces a Plant that yields three hundred and sixty Thousand Seeds : and then he adds after *Grew*, that the *Phyllitis*, or Harts-Tongue, which is a sort of Maiden-Hair, produces even a Million of Seeds.

The oleaginous Humour that is in all Seeds, contributes to their Nourishment and Preservation. The Antients were of Opinion, that Seeds would retain their Fecundity near forty Years: *Morison* will allow them to continue fruitful but ten ; after which they grow dry and unfit for Vegetation. *Ray* confesses he never made the Experiment on Seeds of above five Years old ; and therefore he cannot warrant their Fruitfulness for a longer time. He says it depends very much on the manner of keeping them ; and that they must not be kept too moist, for fear they should grow rotten : nor too dry, lest the moisture that maintain and preserves them, should waste and consume itself : nor too cold, for that will chill and extinguish the Spirit of Life that is concenter'd in the Seed. This Observation is of Use, and so too is the following.

In regard to large Seeds, as Filberds, Walnuts, Almonds, &c. we must be careful, in order

der to facilitate their Germination and Vegetation, that the Point of the *Radicle* be downwards, and the Plume upwards: for otherwise the Root will be forc'd to turn itself aside, and to make a half Circle to shoot down into the Earth: the Stem in like manner will be oblig'd to take a compass, and to form it self likewise into the shape of a Semi-Circle, that it may mount perpendicularly towards the Surface of the Earth. Thus Art must sometimes help Nature.

ARTICLE II.

The Root.

THE Root is the lowermost part of a Plant, and is hidden in the place where the Seed has germinated. This Root is the *Radicle* grown bigger: 'Tis often divided into several small Filaments, by which it receives the Juices of the Earth for its Nourishment.

In the Root five things are to be consider'd; that is to say, the *Skin*, the *Parenchyma*, the *Lignous Body*, the *Insertions*, and the *Pistb*.

1. The *Skin* is likewise the continuation of the *Cuticle* of the Seed. The use of it is to filtrate the Moistures of the Earth, before it communicates them to the Parts of the Root: and indeed 'tis pierc'd with an infinite number of little Pores, that make it as it were a very fine and close Sieve.

2. The *Parenchyma*, together with the *Skin*, forms the Bark of the Root. 'Tis as it were a kind of Sponge, that retains the nourishing Juice, to prepare and transmit it afterwards to the lignous Body.

D 3

3. The

3. The *Lignous Body* is a Substance whose Contexture is more compact and close than that of the Bark ; 'tis perfectly round like a Ring ; and by the means of many small Fibres, corresponds with the Parenchyma. This lignous Body receives the moisture, which the Parenchyma imparts to it, renders it more perfect, and feeding itself with it, increases in height and bigness. The rest goes to the Parenchyma, and to the Skin, who derive their nourishment from it.

4. The *Insertions* are certain Intertextures and Communications of the Parenchyma, that passes athwart the lignous Body, to extend itself even to the Pith. Their Use is to filtrate and bring to its last Perfection the Juice with which the lignous Body is nourish'd, and to distribute it to all the Parts that have need of it.

5. The *Pith* draws its Origin immediately from the Parenchyma of the Bark. The Juice passes thro' the Insertions to go from the Bark to the Pith, which is in the Centre of the Plant, where the lignous Body infolds and keeps it. The Pith is as it were a Vessel into which the Juice enters, there to ferment and purifie itself : and when it has there receiv'd its full Perfection, the Insertions serve to distribute it duly to each Part.

Græw says that the Roots of all Plants have Pith ; and *Ray* says that the Roots of Tobacco and of the Thorn-Apple have none. Let them dispute it.

There are some Roots, which when cut a certain way, discover Figures that are enough surprizing. The Root of Fern cut obliquely, represents an Eagle with its Wings display'd.

The

The Root of *Pareira Brava* has in its Centre a Sun exactly delineated, and surrounded with as many Circles divided by Rays, as the Plant is Years old.

ARTICLE III.

The Stem.

THE uppermost part of a Plant is the *Stem*, which joins to the Root. The place where the Stem and the Root join, is called the *Juncture*. The Stem rises upright from the Root, which is the Basis of it. In Trees 'tis call'd the *Trunk*; and in the several sorts of Corn, the *Stalk*.

The Stem, has, like the Root, a *Skin*, a *Parenchyma*, a *Lignous Body*, *Insertions*, and *Pith*; and the use of these Parts is almost the same as in the Root.

Leeuwenboek, who had study'd more than any Man, the structure of the Stem of Plants, and the Fibres of the Wood that composes the Trunk of Trees, tells us he had observ'd three sorts of Pores or little Channels in the structure of the Wood of different Trees, which he had examin'd with the Microscope. Some of these little Vehicles of Communication go from the bottom upwards; others cross-wise or horizontally, that is to say, from the circumference of the Trunk to the Center; and a third sort turn round in a Circle towards the Bark of the Tree.

The Use of these three sorts of Pores is to convey and duly distribute the nourishing Juices that ascend from the Root, to nourish all the Parts of the Tree. That learned Natu-

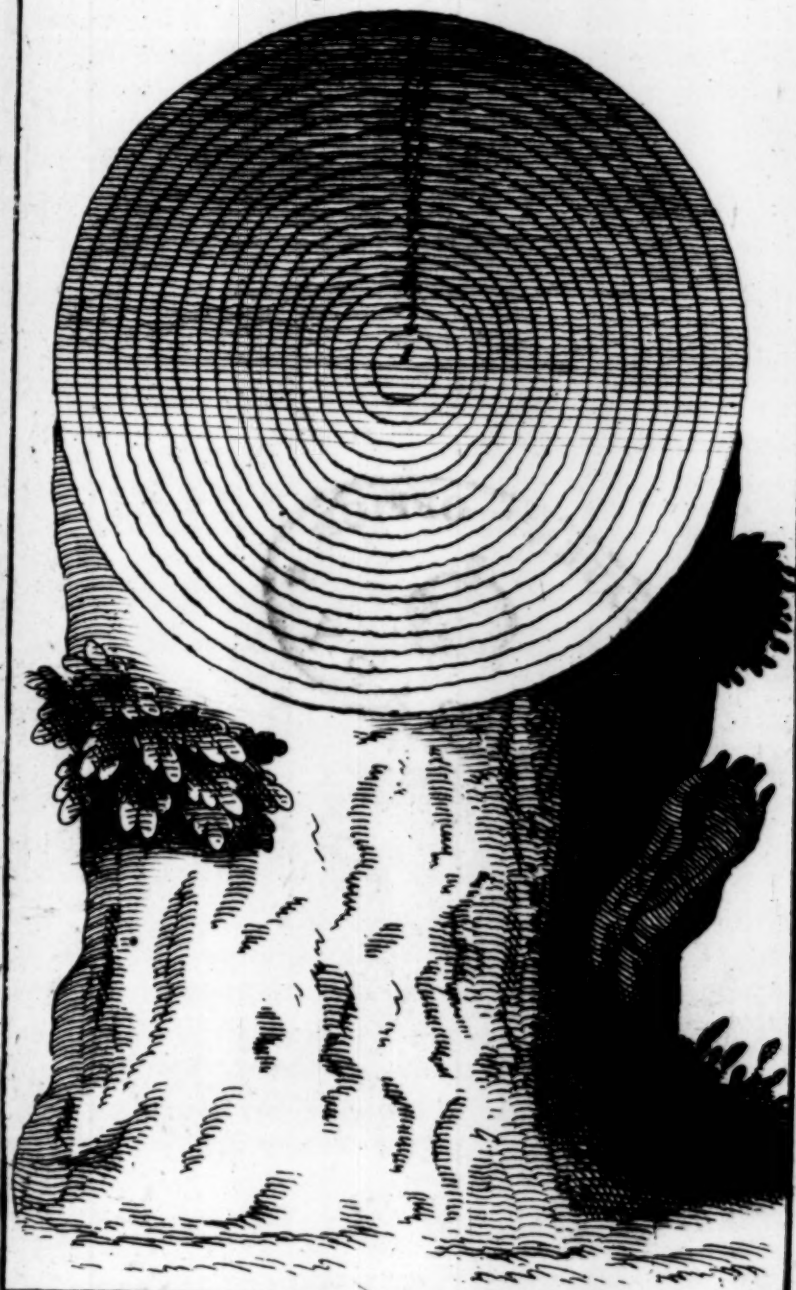
ralist adds, that the Opinion generally received, that the Bark of the Trunk draws its aliment from the Root is erroneous: for, says he, the Bark is nourish'd by the Trunk itself, with which it has communication by the means of little Filaments, that are something circular; such as may easily be seen in the Birch, the Cherry, the Peach-Tree, &c. *Cortices arborum, non ex radice, verum ex ligno, produci & nutriri statuo.* Epist. pag. 20. Tom. 2.

Thus the Wood of Trees is only an Infinity of very minute Pipes or hollow Fibres, thro' which the nourishing Juices ascend into the whole extent of the Tree. Or, otherwise, the Trunk is a sort of Vessel or Cask, that hinders those Juices from being lost or corrupted, as *Malpighius* says, by the Intemperance of the Air. *Fibræ lingneæ tubulosa corpora.*

Leeuwenhoek gives us the Figure of the Trunk of an Oak, cut horizontally, where we plainly see eighteen Circles very well represented. The number of the Circles shews how many Years the Tree is old; that Oak therefore was eighteen. A new Circle is form'd every Year between the Bark and the Trunk. These Circle are not equally thick, nor nourish'd alike; which depends on the Fertility of the Year: for in a Season favourable to Vegetation, the Circle is larger. *Quercus habens octodecim circulos, signa clarissima & indubitata octodecim annorum; ita ut quolibet anno uno au-geatur circulo.* Epist. Part. 2. pag. 13. Tom. 2.

We may therefore be certain of the Age of a Tree by counting the number of its Circles; supposing the Tree to be within the Years of growing. 'Tis said Oaks grow till they are

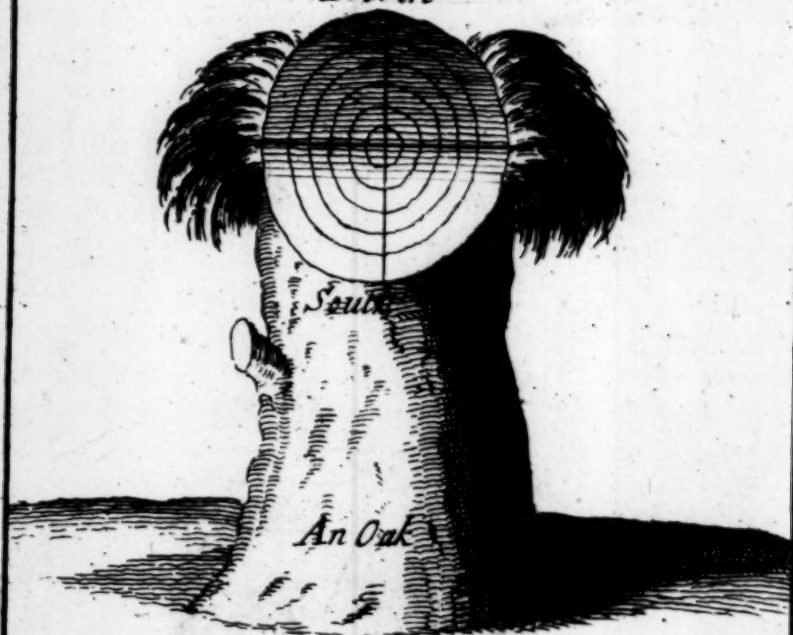
An Oak of 18 Years Growth .





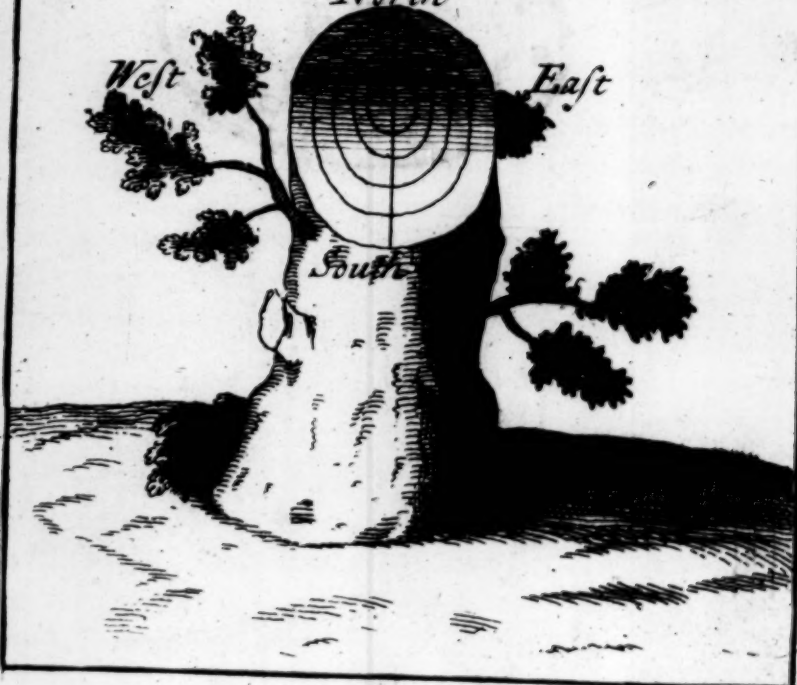


North



An Oak

North



a hundred Years old : after which term they form no new Circles. We may then say of an Oak, as the Jockeys do of a Horse of eight or nine Years old, who has no longer certain Teeth in his Mouth ; that his Mark is out.

Besides these Circles, there are in the Wood of some Trees, Figures that are pleasant to look on ; and which we admire as the Work of sportful Nature. In the Mistletoe a Sun is exactly figur'd. In the Willow we find the Figure of a Serpent ; and if 'twere thought fit to carry on these Observations farther, something would always be found, worthy the Attention of the curious.

OBSERVATION.

HERE it will be of Use to take Notice,
 1. That these Circles which we discover in the Trunk of a Tree, cut horizontally, are not perfectly round, but always incline a little to an Oval ; so that the Pith is never exactly in the middle. 2. That the Tree is better nourish'd, and that the Circles are thickest on the South side of it. On the contrary, that the Trunk thrives least on the North ; and that the Ray from the Centre to the Circumference is the shortest of all. For which there can be no other Reason than the Aspect and Heat of the Sun, who dilates the Pores, and the Fibres of the Tree, and keeps them in a condition easily to receive the nutritious Juices. The part of the Trunk that stands to the North, is dry'd by the Wind that blows from thence, and is always unfriendly to Vegetation. Experience confirms this Reason : for if we examine

mine the Ebony, that grows in the Torrid Zone, where the Trunk of that Tree is warmed on all sides alike by the Rays of the Sun, we find that the Circles delineated in the Fibres of the Wood, are all perfectly round and exactly concentrick; because in all its Parts it receives an equal distribution of the Juices of the Earth.

This Observation may be of twofold Advantage to us.

1. To teach us that 'tis of Importance, when we transplant a Tree, to replace it in the same situation it was in before, in regard to the four Cardinal Points of the World: that is to say, that we must place to the South that side of the Tree that grew so at first: for if we expose to the North, the side that grew to the South, the Tree will certainly languish; because the Pores that were before dilated by the heat of the south, wou'd be straiten'd and shrunk up by the biting Northern Blasts, and refuse a Passage to the alimantal Juices; and the Pores that had long been contracted by the cold of the North, would not from thenceforward be in a Condition to open themselves again to the heat of the South.

2. The Second Advantage is, that a Man, who has lost his Way in a Wood, or in a Forest, may easily recover it, by finding out the East of the Place he is in; which is done thus: We cut off a Branch from a Tree, and consider which side of it is least nourish'd, and that we conclude grew towards the North. We turn our Faces that way, and then we have the South behind us, the East on our Right, and the West on our Left; and if the Place
where

where we are to lie that Night be Westward, we turn off to the Left. This contrivance may chance sometime or other to be of great help to us, but it is impracticable in the Torrid Zone. *Maiolus* says, that several great Princes had lost themselves in Forests where they were hunting, and instead of the Diversion they hop'd to receive, sometimes were in Danger of their Lives. *Maiol. de Plantis, Colloq. 21. pag. 462.*

ARTICLE IV.

Of the Buds, the Branches and the Leaves.

THE Buds are only the Trunk continu'd: He therefore who understands the Trunk, knows what the Buds essentially are.

The Branches too are the same thing, since they are only Buds, that in time are grown to be Branches.

The Leaves are not much different from the Buds, since they at first were Buds, that have unfolded, and display'd themselves.

When the Leaves are folded up, they surround the Flowers, and expose them not to the open Air but by little and little, and according as they can bear it. When they are unfolded, they defend the Flowers and the Fruits from all harmful Accidents; especially the Fruits that are nice and tender, as Strawberries, Grapes, Mulberries, &c. which would dry away and perish, without the freshness in which the shade of their Leaves preserves them.

Ray

Ray is not of their Opinion, who vulgarly believe, that Leaves were given to Trees, only to furnish a delightful Freshness; and to hinder the excessive heat of the Sun from scorching up the Flowers and the Fruits. If he be in the right this vulgar Error ought to be laid aside, and the Opinion of this learned Naturalist should be follow'd. He pretends that the Leaves serve to concoct and digest the Aliment, and to send it well-prepar'd to the other Parts of the Plants. He follows in this the Opinion of *Malpighius*. Nevertheless 'tis certain, that as soon as the Fruits are ripe, the Leaves drop off the Trees, as if they were of no farther service to the Race of Vegetables. And under the Line, where the Weather is always hot, the Leaves never fall from the Trees, because they are necessary to make a shade: thus there is some appearance that this is the chief Work, for which they were first design'd. At least this is more apparent to us, than the Concoction and Digestion of the nutritious Juices, which some are willing to believe.

ARTICLE V.

The Flowers.

THE Flowers, according to *Ray*, are what is most pleasant and most beautiful in Plants; but their Beauty, says he, is frail and transient. He adds, that they are remarkable for the Enamel of their Colours, and for the Regularity of their different Figures: that they appear only to usher in the Fruit, or the Seed; and that afterwards they fade, wither, and dye away.

They

They are the Joy of Nature in the Spring. They are upon the Earth what the Stars are in the Skies. As the Stars are the Flowers of Heaven, the Flowers are the Stars of the Earth. They are so magnificently set off, that the Saviour of the World scrupled not to say, that the Ornaments of Kings in all their Pomp were not so splendid. *Consider the Lillies, how they grow. They toil not, they spin not: and yet Salomon in all his Glory was not array'd like one of them,* Luk. 12. 28.

A Flower is compos'd of three Parts; the *Cup* or the *Empalement*, the *Foliation* or the *Leaves*, and the *Heart*, which is likewise call'd the bottom, or the middle.

1. The *Cup* is that which infolds the Leaves and the Heart of a Flower, while it is yet in Bud: and when the Flower is blown, it supports the Leaves, and holds it in a certain Order, that contributes to the Beauty of its Figure.

2. The Leaves are of so many different Shapes and Colours, that the Variety of them can not be seen in Fields, in Meadows, and in Gardens, without admiring the Riches of Nature. — They serve to cover the Heart of the Flower.

3. The *Heart* of Flowers is of two sorts. Some of them are *Seeded*: and these are compos'd of several Threads, to each of which there sticks a little Seed; as we see in Tulips and in Lillies. These Seeds contain a Dust, which charms the Sight, when beheld thro' a Microscope. Besides these seeded Hearts, there are others that are *bloomy* or *flower'd*: as the bottoms of Marigolds and Sun-Flowers: and these
are

are call'd *Stamina*, because they are thought to be compos'd of very fine Hair-like Threads.

If we duly weigh the Matter, the Heart of the Flower will appear to be the most considerable part of it, since the two others are made for that. In that sort of them that are bloomy, there are Flocks of little Animals that live there as the Sheep do in the Valleys and on the Mountains. By the help of a Microscope we can easily discern these little Insects, together with a thousand other wonderful things, that are very diverting.

The Flowers are destin'd to preserve the Infant Fruit, which they cover and defend till it has got strength. As fast as the Fruit forms itself, the Flower fades away, and drops at length, when 'tis no longer serviceable to it.

'Tis from Flowers that Bees gather the Honey, and the Wax of which they make their Combs, which are always perfectly Hexagonal. Honey relieves the Sick; and Wax serves for the Altar. There is no Insect in the Universe, whose Toils are so useful to Mankind. Their OEconomy is wonderful. They who get themselves Hives of Glass, that they may see their Bees work in them, have no cause to repent of their Curiosity: nor can I blame the Philosopher *Aristomachus*, who spent sixty Years in contemplating the Polity and the Government of their Commonwealth, whose Basis is chiefly grounded on a mutual Love of one another.

ARTICLE VI.

The Fruits.

THE Word *Fruit* comes from the *Latin* Word, *frui*, to enjoy; because 'tis the Part of the Plant that we make use of for our Aliment.

An Apple is a Fruit compos'd of four Parts; the *Skin*, the *Pulp* or the *Parenchyma* swell'd and bloated; the *Fibres*; and the *Core* which contains the Seeds, by us call'd *Kernels*. Besides these Parts, a Pear has one called the *Quarry*, which is a little heap of stony Knobs.

Plums, Cherries, Peaches, and Abricots, have a *Stone* instead of a *Core*. In the Stone is a Nut or Kernel, which is the Seed of Stone-Fruits.

Filberds and other Nuts have a *Husk*, a *Shell*, and a *Kernel* or Seed.

A Grape is compos'd of *Skin*, *Pulp*, *Fibres* and *Seeds*.

Fruits are appointed for the Nourishment of Men and of Beasts. They serve likewise to nourish and preserve the Seed, contain'd within them. In the beginning of the World they were the sole Food of Men; and 'twas not till after the Deluge that God permitted *Noah* to nourish himself with the Flesh of Beasts. *Genes.* 9. 3. Fruits nevertheless are still the most agreeable Service of Tables; nor is there any Food more delightful or Healthy.

Some Fruits are exceedingly charming. Such was the Cluster of Grapes brought back by the Spies, whom *Moses* had sent to examin the Fertility of the Land of Promise. Two Men were for'd

forc'd to carry it between them upon a Staff. They cut down, says the Scripture, a *Vine Branch, with its Cluster of Grapes, which two men bore between them on a Staff.* *Absciderunt Palmitom cum uva sua, quem portaverunt in veste duo viri.* Numer. cap. 13. v. 23. Philo the Jew says it was but one Cluster: nor is there any thing incredible in it. Pliny relates that in *Populonia* he saw a Statue of *Jupiter*, made of the Trunk of a Vine; whence he concludes that Trunk to have been of an extraordinary bigness. He adds that in the Inland Countries of *Africa*, there are Vines that bear Clusters bigger than Children. *Hist. Nat. lib. 14. cap. 1.* Strabo says that in *Margiana*, where *Antiochus Soter* built *Antiochia*, they often see Vines so big, that two Men can scarce clasp them, and that the Clusters of Grapes are two Cubits long. *Tradunt saepe vitis truncum inveniri, quantum duo viri complecti queant, racemum duorum cubitorum.* Geograph. lib. 11. pag. 360. And if we may give credit to *Aloysius Cadam*, there are in the Island *Madera*, which is one of the *Cunaries*, Clusters of Grapes above four Hands long, and whose Grapes are as large as a Hens Egg. 'Tis certain that *Palestine* was then one of the most fruitful Countries of the Earth. Men grew there to a proportionable Growth with the Trees. Most of the Spies whom *Moses* sent thither, were so terrify'd at their huge Stature, that they voluntarily refus'd to undertake the Conquest of the Country. *There we saw, said they, Men like Monsters, the Sons of Anak of the Race of Giants, in comparison of whom we seem'd but Grasshoppers.* *Quibus comparati, quasi Locustæ videbamur.* Numer, cap. 13. v. ult.

CHAP. III.

Vegetation explain'd according to the new Discoveries.

BY the word *Vegetation* we mean the Action by which Plants and Trees nourish themselves, grow, blossom, and multiply by the means of their Seeds.

Plants grow not like Stones, but by *Intus-susception*; that is to say, the Juices of the Earth set in Motion by Fermentation, insinuate themselves into the Pores of the Roots, and are drawn up by the heat of the Sun into the Stem, where they coagulate, and unite themselves to the interior Parts of the Plant. Stones on the contrary grow by *Juxta-Position*, because their Growth is only outward; new Parts uniting themselves exteriorly to the former.

'Tis not altogether without appearance of Reason, that some Philosophers have attributed to Plants an animal Life: for there is a great Analogy between Plants and Animals in the way of their being nourish'd. But not to run upon Extreams, I will not assert with *Grew*, that Plants have Entrails, a Heart, Liver, &c. but will allow them only to have some organical Parts, that are analogical, that is to say, almost like some which we may observe in Animals. The Fibres and little Vehicles that are in the Bodies of Plants, are as so many Veins; and the nourishing Juice, which we often call *Sap*, answers to the Blood. 'Tis the Motion of this *Sap* that causes the Plant to vegetate. 'Tis this

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pretious Liquor that makes the Seed germinate, the Leaves unfold, the Root and the Stem lengthen, the Buds peep out, the Branches spread, the Flowers blow, and lastly that forms the Fruit and the Seed ; but all this variously in the different Plants, and according to the Figure and Disposition of the Pores, thro' which this nourishing Juice passes : whether it be that these Pores give a Figure to the Juice as it passes thro' them ; or whether they give Entrance only to such Parts of the Juices, as are proper for the Formation of each Kind of Plant. Strong Reasons are given for either Opinion. The first has some eminent Patrons, but the second seems to me to be most natural. And perhaps if we examin'd these two Suppositions impartially, we should find that at the bottom they come both to one and the same thing. For in the first Hypothesis 'tis said, that the Pores shape their Juices, in like manner as the *Ajutages*, or Pieces of Tin or Iron that are plac'd at the ends of the Spouts of Fountains, make the Water fall like Rain, like a Table-cloth, like a Glass, or in any other Figure, according to the different shape of the *Ajutage*. Is not this the same thing as to say, that the Pores suffer no Juices to pass, but such as are shap'd like themselves, which is exactly what the second Opinion lays down.

However it be, 'tis difficult to determin, how the nourishing Juice or the Sap can rise to the top of the Trees that are so high. Ray, after having refuted the Opinions of some Philosophers on this Subject, says, that 'tis safest and most reasonable to believe, that the Sap mounts to the Top of the Tree, as Water rises into Bread,
into

into a Sponge, or into a long piece of Cloth. We know by Experience, that if one end of a piece of Cloth be laid in Water, the Water will rise insensibly to the other end of it. In like manner the Fibres, and the small tubular Vessels that are in the Wood of Trees, are of the same Nature with the Pores of Bread, of a Sponge, or a Piece of Linnen or Woollen Cloth, which are made use of to filter any Liquors. To this opinion all the Pride of Philosophers must be forc'd to buckle; for to have recourse to the capillary Vessels of the Earth, to the Weight of the Air, to the equal Ballance of Liquors; and to the circular Motion of the Earth, will but puzzle and confound us; and I have so good an opinion of Philosophers, as to be perswaded, that they do not themselves believe the Doctrine they preach to us on that Subject.

'Tis not so difficult to explain how the Juices of the Earth enter into the Roots of Plants. The Rain or other Waterings dissolve the Salts of the Earth; this puts the Juices in motion, and then the Subterranean Heat drives them upwards, after this comes the Heat of the Sun, which dilates the Pores of the Plants, and opens a Passage for the Juices to mount up into the Stem, and into the Branches.

What I have said of the Heat of the Sun, is no dispute. All Men agree that the Return of that Planet in the Spring, prepares the Plants to receive whatever has been concocted and digested in the Roots, and in the Earth, during the Winter: All who admit of this Concoction and this Digestion, will not allow the Central Fire, to be the efficient Cause of it;

may, many doubt even of its Existence. We will therefore shew, that there is such a thing as this Central Fire.

OBSERVATION.

There is Fire in the Center of the Earth.

THE Central Fire manifests it self too many ways to leave any doubt of its Existence.

1. It makes it self be felt in the hot Springs and Baths.

2. It shews it self by four or five Hundred Vulcanos, which in some Parts or other of the World, vomit up Fire, Flames and Ashes; as *Vesuvius* in Italy, *Aetna* in Sicily, and *Hecla* in Island. Travellers in their Relations, give an Account of near five Hundred of these Vulcanos, or burning Mountains.

3. This Subterranean Fire is attested by the Evidence of such as work in Metallick Mines. They say, that the farther they dig into the Entrails of the Earth, the more they find a troublesome Heat, that still increases as they go lower down, especially after they are got four Hundred and eighty Foot deep. *Morinus Relat. de locis subterr. pag. 131.*

Stephen de Clave imployes, the first Chapters of the Second Book of his Philosophical Treatises, to prove the Existence of this Central Fire, and that it is the efficient Cause of Minerals, of Vegetables, and of Animals.

Bary in his *Physicks*, admits five sorts of Fires, one whereof is the central. He says, that this subterranean Fire, forms the Metals in the Bowels of the Earth, where the Sun can have

no effect, the Heat of that Planet never penetrating above ten foot deep. Then he adds, that whether the Heat of the Sun be volatile or not, 'tis certain, that Workers in Mines, the deeper they go into the Earth, feel the more Heat. And according to this Hypothesis, he explains how it comes to pass that Winter strips the Trees of their Leaves. What he says on that Affair so nearly concerns our Subject, that we may not omit to recite it. At the Approach of Winter, says he, the Leaves drop off the Trees, because the Juices are not heated enough to pass from the Roots to the Branches, and because there is not Sap enough remaining to nourish the Leaves. In Winter, the subterranean Heat is driven downwards by the Cold; and that Heat, tho' it be far distant from the Centre, has nevertheless some Effect. It introduces it self into the Roots, together with the Vapours and the Exhalations. It causes some Fermentation; it prepares some Nourishment; but not being able to drive up into the Branches, what it has begun at the Root; the Plant receives not any fresh supply of Nourishment, till the Sun, strengthening the Central Heat, revives Nature, warms the Earth, rarifies the Fibres, and enables the fermented Juices to mount up into the Trunk and Branches. Then these dry Plants no sooner feel the mild Return of the Spring, which dissolves the Balsamick Salts, than they appear adorn'd with Leaves, and crown'd with Flowers. *Tom. 2. pag. 104 and 105.*

This Naturalist joins the Heat of the Sun with the Heat of the central Fire, for the Vegetation of Plants. This Concourse of the Sun of the

Earth, and of the Sun of the Heavens, is doubtless the Harmony of Nature, that unites these two Causes in the Formation of Vegetables. And indeed, one Part, which is the Root, is in the Earth, and the other, which is the Stem, seems to be absolutely under the Jurisdiction of Heaven. Heaven and Earth, must therefore mutually assist each other.

If the Sun, like the Rain, never penetrates lower than ten Foot into the Earth, 'tis a meer Vision to ascribe to that Planet the Generation of the Metals that are found in the Mines of such a Depth. *Baguinus*, speaking of a Mine of Silver in *Hungary*, says, 'tis five Hundred Cubits Deep. He says, that the Miners who work in it, are continually incommoded with excessive Heats; *Tyrocin. Chymic. lib. 2. cap. 14.* and certainly the Sun can have no Influence so deep in the Earth.

Saint Romain, allows these subterranean Fires as a thing not to be contested, but does not place them at the Centre of the Earth. It cannot be doubted, says he, but there are Fires in the Earth. *Hecla, Aetna and Vesuvius*, are incontestable Proofs of it. And as there are Fires above us, which are the Stars, there are likewise some beneath us, which have been kindled in the Earth ever since the Beginning of the World; and are the Cause of the Heat that we find in Mineral Waters. *Scient. Nat. Part. 3. ch. 14. pag. 272 and 273.*

Vossius brings six Arguments to prove that there are subterranean Fires. 1. The Vulcanos. 2. The Exhalations and Smoaks of the Earth. 3. The Fountains, that are on the Tops of Hills. 4. The hot Baths. 5. The Earthquakes. 6. The Gene-

ration of Metals and other Fossils. According to him the subterranean Fires are instituted by Nature, and are the efficient Cause of the several Phænomenons, we but now mention'd. He says very well; that the Sun in the Heavens having no Effect above ten Foot deep in the Earth, 'tis necessary that in the Bosom of it, there should be an *Anti-Sun*, an Earthly-Sun, or an opposite Fire, to diffuse on all sides its Heat, by all the Passages and Pores that Nature has prepar'd for that purpose. *Præter illum solum cælestem, quemdam agnoscere oportet ævthiæon sive solem, vel ignem adversum: unde cæcos per meatus seu undique diffundat.* De Idololat. lib. 2. cap. 63. pag. 644.

'Tis beyond all dispute that *Kircherus* carries the Day concerning this subterranean Philosophy. The Naturalists before him knew but little of the Operations of Nature under Ground; but he has penetrated the profoundest Depths, and descended to the very Centre, where he has discover'd better than all the Philosophers put together, the whole Secret of the Generation of Minerals. To him we owe the Knowledge of this *Pyrophyllacium*, this *Treasure of Fire*, that is at the Centre of the Earth. There is, says he, a Treasure of central Fire, that manifests it self by the Vents of the Vulcanos, and by the Exhalations and warm Smokes, which we see steaming out of the Earth. This *Pyrophyllacium* is the Cause of the hot Baths, by the Exhalations and warm Vapours that it forces upwards. When these Exhalations convey themselves into any cold Cavern of the Earth, they resolve into Water, and form Fountains and Streams. They dissolve likewise the metallick

Juices, and contribute to the Production of Minerals, &c. *Ignis Pyrophyllacium sub terra centrale est, quod undequaque per pyragogos canales, exhalationes spiritusque igneos diffundit. Hos Hydrophyllaciis impaetos partim in thermas disponit, partim in vapores attenuat. Qui concavorum Autorum fornicibus illi, frigore loci condensant in aquas; denique resoluti fontes riveque generant: partim in alias diversorum mineralium succis fetus matrices derivati in metallica corpora coalescunt, &c.* Mund. Subterr. Tom. 1. lib. 4. f. 1. cap. 2 & 3. None of the Ancients have argu'd so rationally on this Philosophy.

Herbinus says, that of this *Treasure of central Fire* are form'd the *Cataracts of fire*; that is to say, the subterranean furnaces, that serve, 1. to form, melt and purify the Metals in the Bosom of the Mines, as in so many Crucibles made by Nature. 2. to distill in the Cavities of the Earth, as in so many Alembicks, the mineral Substances, in order to send up towards the Surface of the Earth, warm Vapours, and sulphurous, aluminous, salt, vitriolous, nitrous, &c. Spirits, that they may impart their medicinal Virtues to Plants, and to mineral Waters. At sight of this all-wondrous and all-divine Order, which was establish'd wholly for the Good of Man, can we do less than cry out with the royal Prophet; *O Lord, How manifest are thy Works! In Wisdom hast thou made them all; the Earth is full of thy Riches.* Psalm 103. v. 25. I could not conclude this Observation concerning the central Fire of the Earth better, than by this judicious Reflection of *Herbinus*. *De Cataract. admirand. Mundi*, lib. 2. Dissert. 1. cap. 14. pag. 15.

Thus

Thus you see how the nourishing Juices enter into the Roots of Plants. The subterranean Fire drives them to the Stem; and when they are there, the Heat of the Sun performs the rest, by drawing them up even to the Ends of the Branches; either because it dilates their Pores and their Fibres; or because it subtilizes the Matter of the Juices, reducing them into Vapours and Steams; or rather because it does both at once.

There is one thing not to be question'd in the Vegetation of Plants; which is, that there are none but what come from Seed; tho' the Antients were of Opinion that several Vegetables were produc'd without it: *Ray* too holds with them in regard to imperfect Plants; as Sea-Weed, the several Sorts of Coral, Mushrooms, Truffles, and Ground Mosses. And even as to perfect Plants he inclines to the Opinion of the Antients. The Mistletoe, which comes by Chance, seems to him to decide this Point; and he doubts not but *Virgil* was in the right to say,

*Quale solet sylvis brumali Frigore Viscum
Frondevirere nova, quod non sua seminat arbor.*

Æneid. lib. 6.

But let us leave him, and see what *Malpighius* says of it. He being desirous to know the Truth of this Matter, made the following Experiment, which determin'd his Opinion concerning it. He put some good Earth into a Vessel of Glass, and cover'd it with a fine Linnen Cloth, so that nothing could get in but the Air, the Sun, and the Rain: thus being certain that the Wind could convey no seed into the Vessel, he left it a long time expos'd to the Air,
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the Sun, and the Rain, and there never grew the least Appearance of a Plant in it. From thence he concluded that no Plants are produc'd without Seed.

But nothing can be more convincing in regard to this Affair, than what is related of the Experiments of M. Tournefort, in the Memoirs of the Royal Academy of Sciences, where we find these Words. *'Tis notorious that almost all Plants come from Seed: and 'tis to be presum'd, that those whose seed is unknown to us, nevertheless proceed from Seed; but that the smallness of it makes it imperceptible. The Antients assure us that Fern has no Seed: yet the Moderns, after having maturely consider'd the Dust that sticks on the Back of the Leaves, have discover'd that to be the Seed. 'Twas believ'd that the sort of Moon-wort, on which some Chymists set so high a value, had no Seed: However 'tis now allow'd to have some, but so small that it cannot be perceiv'd without a Microscope. The Moderns have discover'd that Oak-fern has seed, and Grew has found some likewise on the Back of the Leaves of Harts-tongue. Moreover 'tis now allow'd that the Herb Adders-tongue, and the Maiden-hair of Montpellier come from seed so small, that it can scarce be perceiv'd. To these we add the red Coral, because 'tis likely that the little Embryo's, which we see on several things taken from the bottom of the Sea, proceed from some Seed, fallen from the Milk that is contain'd in the little round Knobs at the end of the Branches. The Herbs Orchis and Ophris, Hellebore, Winter-green and Choak-weed, have all of them Seed, but so small that it cannot be perceiv'd. Such too in all appearance is the Seed of Mushrooms.* Memoirs of 30. June 1692. pag. 106. 107. 108. 109.

To explain the whole Course of the Vegetation of a Plant, we will pitch on that of a large Bean, of which we gave the Anatomy in the foregoing Chapter. We will put it into the Ground, and not leave it till it has produc'd a Plant, nor till that Plant be adorn'd with Flowers, and loaded with Beans.

Tho' there be not a perfect Analogy between a Plant that come from a Bean, and an Oak that comes from an Acorn; we shall nevertheless have a Glimpse of the Method of Nature in the Production of an Oak, when we know the way she takes in the Vegetation of a Bean. Nature observes so uniform an OEconomy in all her Works, that she is the same throughout the whole. She has but one sort of Organs, and observes the same Order in the Generation of all Plants, as in the Production of all Animals.

The Vegetation of a Bean.

1. This little Body, call'd a *Bean*, being put into a moist Earth after the Vernal Equinox, begins to swell, filling it self with the vivifying Juice, with which the Earth is impregnated. This swelling is occasion'd by the Fermentation, which the Humidity, that soaks in at the little Hole, of which we have spoken, causes in the Body of the Bean. Then the Skin must necessarily burst, to give way to the Dilatation of the Body that enlarges it self. The Prison being thus open'd, and the Chains broken, the *Radicle* pierces into the Earth, and the *Plume* lengthens and shoots upwards. This first Advance is call'd the *Germination*, which is only a Swelling, caus'd by the Fermentation in the

Parts

Parts of the Bean. This Germination is the first Accident that happens to the little Plant, concentr'd in the Body of the Seed, whose Parts swell almost like a Sponge in Water.

2. The Plume not having so far to go to raise it self up to the Surface of the Earth, naturally follows that Route, and the rather because its Point is upwards. Moreover an Earth newly dug and turn'd up, is light and easy to pierce. In short, the Sun, the Dews, the Air, and the Rain, that continually agitate the Surface of Earth, open a ready Passage to the Plant, and court it to rise upwards; which too perhaps it does, because the Parts that compose it, are more volatile, more sublimated, and if I may use the Expression, more *spirituous* than the Parts that compose the Radicle, which scarce is grown a Root, but the Plume becomes instantly a Stem.

3. In the Heart of our young Plant we see growing a sort of Filament in a strait Line, which rises up proportionably, as the Heat sublimates the nourishing Juice, and pushes it upwards. This Filament is the Stem, to the end of which, the sublimated Sap flows in great Quantity; and there are form'd the Knots and Buttons, from whence soon spring forth Leaves and Branches.

4. From these small Buds, that are compos'd of a Matter hastily driven up by Fermentation, and condens'd by the freshness of the Air in the end of the Branches, spring the Flowers, which the more the Sulphureous Matters abound in the Sap, are the more variegated in their Colours. These Sulphureous Parts being what is most subtil in the nourishing Juices,

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mount without difficulty to the Extremity of the Branches, where they coagulate themselves in order to give the Flowers that lively and beautiful Colouring, which is always their chief Merit, and sometimes the Despair of the most skilful Painters.

5. These sulphureous Matters that compose the Flowers, having but little Consistence, are soon devour'd by the open Air, which destroys those frail and squeamish Beauties. The Flower fades and dies away, because a little tender Button, which it had for some days protected against the Assaults of too sharp an Air, robs it of its Nourishment, which it retains all to itself, feeds on it, grows, and becomes more hardy. This Button is the Infant Fruit, that succeeds the Flower, and gives Death to that, from whence it receiv'd its Being. What I here call'd the Fruit of the Bean, is a Pod, which at the time of its Maturity, is fill'd with four or five large Beans, like that from whence springs the Plant, which we have so exactly describ'd.

6. The Death of the Plant, according to the usual Course of Nature, proceeds from the want of the precious Balsamick Juice, which makes all Plants germinate, swell and grow. This want of Sap may be owing to the Soil, which being exhausted by former Vegetations, is no longer capable to produce any thing; it may likewise proceed from the Plant it self, whose Pores, both of the Stem and Root, being grown too dry by the great Heat of the Summer, cannot open themselves again to admit the nourishing Juices. The Plant, grown dry and wither'd, is unfit for the Functions of
Vege-

Vegetation: and thus there is no Remedy, it must dy. *Et dura rapit inclementia Mortis.* Virg. *Georgic. lib. 3.*

These Principles being premis'd, 'tis easy to explain all that happens to the Plants of our Climate in the different Seasons of the Year.

1. In Spring, the whole Race of Vegetables, that lay benumm'd, and as it were in a Lethargy, during the Cold of Winter, which congeal'd the Juices in the Pores of the Earth, or that retain'd them in the Roots, awaken and crown themselves with Leaves and with Flowers: because the Juices of the Earth, and the Nitre of the Air, blended with the Rains, the Hail and the Snow, melt themselves, are fermented by the Heat of the Sun that comes near us; and by this Motion are dispos'd to mount from the Roots to the Top of the Plants, where they form new Leaves and new Flowers.

2. In Summer, we see several Plants grow dry, and dy away; because the Heat of that Season is sometimes so violent, that it gives the Juices of the Earth too quick a Motion: which causes them to mount with so much precipitation, from the Roots into the Stem, and from the Stem into the Branches, that they stay not there long enough to coagulate themselves. Besides, the Pores of the Branches grow wider by the Quickness with which these Juices pass thro' them; so that they can no longer retain them; and thus the Plant dies for want of Aliment.

Thus *du Tertre* in his General History of *Antego*, has observ'd, that in those Islands every thing Springs in the Winter, and the Fields are cloath'd with Green: but that on the contrary, most

most of the Plants dy in the Summer, and the Leaves drop from the Trees: the Excess of Heat producing in those Islands the same Effect; that the Excess of Cold does in *Europe*.

3. In Autumn, the Leaves and Fruits fall, because the Heat of the Sun growing daily less, as that Planet removes farther from us, the Juices cannot rise up as they were wont: and the Leaves and Fruits, for want of Humectation, grow dry and fall.

4. In Winter, the Trees are in a state of Inaction, and give no Sign of Life, because they draw their Nourishment from the Juices of the Earth. Now the cold of that Season coagulates these Juices, and closes up the Pores of the Trees: 'tis then no wonder that Trees, being depriv'd of what animates and gives them Life, shew no visible Mark of the Functions of Vegetation; nor that they appear in that shameful Nakedness, of which *Virgil* speaks in his second *Georgick*:

Frigidus & sylvis Aquilo decussit Honorem.

There are some Trees that lose not their Verdure in Winter; and these are they we call Evergreens: as the Yewh, the Holm, and the like; whose Leaves are of a more firm consistence: and that are better able to endure the Winters biting Colds, Orange trees too are stronger, they bear Flowers or Fruits in all Seasons; and are never depriv'd of the delightful Ornament of their Verdure, during the severest Frosts. Happy the Climates, where the Trees are never stript of their Leaves, and where Nature maintains an Eternal Spring! *St. Augustin*, says very well, that the Island *Tiles* in the *Indies*, is preferable to all the other Countries of

of the Earth, because the Trees there always preserve their Verdure. *De Civitate Dei, Lib. 21. cap. 5.* The Inhabitants of the Torrid Zone have the Pleasure not to know what our Northern Frosts mean. The great Disorder that the Violent Colds of Winter cause in Nature, whose beauteous Face they so piteously deform, makes me scruple to prefer our Climate before that where the sultry Heats of Summer are scarce to be indur'd. 'Tis charming to see the Trees always cloath'd in their green Attire: but Custom and Uniformity perhaps will render it less agreeable; since they soon make the best Things seem dull and insipid: we love Variety, and the Change of the Scene is pleasant. Beside the Taste of Men is so inconstant that we cannot yet be certain of what they love: It may be too, the most Judicious have not yet agreed of it within themselves.

Egesippus relates a very remarkable thing. He says, that in his Days there was in the Province of *Memphis*, a Turpentine Tree, as old as the World: that it was one of the Trees which God made on the third Day of the Creation; and that during the five thousand Years it had grown there, it had never lost its Verdure one moment. *Egesip. lib. 4. cap. 23.* This was a long-liv'd Tree: let us now speak of a Plant of a short Duration.

Aristotle, after him *Cicero*, *Boecace*, *Cardanus*, *Scaliger*, *de May*, and lately *Swammerdam*, translated by *Thevenot*, have all spoken of the *Ephemera*, a little Insect so call'd, because it lives but a Day. This Creature is born in the Morning, is in all its Perfection at Noon, and dies in the Evening. We see it fly along the Rivers

Rivers towards the End of June. Thus the Course of its Life is sixteen Hours. 'Tis a Child in the Morning, a Youth at Noon, and Old in the Evening. *Ephemerus mane Puer, meridiæ juvenis, senex vesperti*, says Cardanus. 'Tis not only some Animals that live but a Day; there are Plants likewise of no longer a continuance. What can better deserve the Name of *Ephemerus*, than the Gourd of which the Holy Scripture speaks, and which liv'd but a Day. The Story of it is in the last Chapter of the Prophecy of *Jonah*, verses 6 and 7, where 'tis said, *that the Lord God prepar'd a Gourd, and made it to come over Jonah, that it might be a Shadow over his Head, but when the next Morning rose, the Lord sent a Worm which smote the Gourd, that it wither'd.*

C H A P. IV.

What the Sap, or, as Naturalists call it, the nourishing Juice of Plants is.

THere are some Naturalists, who scruple not to say, that Water only is the Nourishment of Plants. 'Tis my Opinion, says Ray, and by the Experiments I have made, I know it to be true: And *Sbarroc* has given us a Catalogue of the Plants, whose Suckers he had made vegetate in Vials fill'd with Water, where they shot out to a Miracle: their Names are as follows, the Female Balsam Apple, all the sorts of Mint, Penny-royal, House-Leek, Self-heal, Water-Cresses, the red-flower'd Meadow

dow Trefoil, Perriwinkle, *Doria's* Wound-wort, Golden Knop, Mallows, the Cherry Bay Tree, the Water Germander, Starwort, Money-wort, Allheal, and Mother-wort.

Ray doubts not in the least, but *Sbarroc*, if he had made the same Experiment on several other Plants, would have found in them the same facility to nourish themselves, and of shooting out Roots in Water. The reason, says he, is, because Water is not a meer and simple Element; but contains many small heterogeneous Bodies, and especially saline Particles. *Aqua enim non est simplex & purum Elementum, sed multas heterogeneas particulas praesertim salinas in se continet.* Hist. Plant. lib. i. cap. 17. pag. 31.

Water alone cannot be the Aliment of Plants: And *Ray* saw very well that something more was absolutely necessary, seeing he adds that Water contains some saline Particles: But I am of Opinion that what he so positively asserts is not always true, and that there are some Plants, to which Water alone is sufficient for their Nourishment.

Indeed, the Sap that nourishes Plants, is not Water only. It has been discover'd that this liquid Substance is found season'd with a nitrous Salt, that is diffus'd in the Air, and upon the whole Surface of the Earth. Doubtless it likewise often contains some sulphureous, mercurial, bituminous, vitriolous, tartarous and metallick Parts, of which the Earth is generally full. These mineral Substances temper themselves in the Water, ferment, rise up in Vapours and Steams, and are receiv'd into the Pores of the Roots for the nourishment of the Stem and Branches.

'Tis

'Tis likewise certain that some very subtil Parts of the Earth mingle themselves with it, and that they impart their Taste to the Plants, as we find by Experience in certain Wines, and in many Legumes and Fruits that have a Tang of the Soil where they grow.

Regis says, *There is a general Experiment that evidently proves, that Plants nourish themselves not with Water only; but also with the Juices of the Earth. We know that the Fields which we sow every year, grow lean by little and little; and tho' they are water'd with Rains as usual, they fail to have the Juices that are requisite for the Nourishment of Plants. Insomuch that after they have born Crops for five or six Years, they must lie fallow for one, or be manur'd with Dung, Marle, &c. to restore their fertility. Thus in my Opinion, besides the Water, there is a certain nitrous Salt, scatter'd on all the Surface of the Earth, which being melted by the Rains, puts the Juices of the Earth into a Fermentation, so that the most subtile of them are rais'd up, to convey Nourishment to the Plants.*

And to this I add, that this Sap is the Effect of divers Fermentations, that are made in the Earth; for the Understanding of which the Experiments of Chymists are of great Help to us.

EXPERIMENTS.

1. **S**ometimes an acid Salt mingles it self with an Alkali: from which Mixture results a Fermentation, and very sensible Heat. Thus Spirit of Vitriol and Oil of Tartar have no warmth apart; but mingled together, are surprizingly hot.

2. Sometimes a volatile, or a nitrous Salt, mingles it self in the Earth with a sulphureous Substance. From which Mixture proceeds an Effervescence, that puts the whole in Motion; from whence there rises up an Infinity of very subtile Particles.

3. Sometimes the Waters that glide in the Sinuosities of the Earth, meet with Sulphur or Lime, which they set on Fire. From thence rise Steams and Exhalations that are most proper for the Nourishment of Plants, and to produce the Variety of charming Flowers, and of savoury Fruits, that are so grateful to the Senses.

4. Sometimes Nitre mix'd with Spirit of Vitriol, makes a Smoak; and the Vapours that stream from that Composition, are visible.

5. Sometimes Spirit of Nitre mixt with Pewter, causes a vehement Heat.

6. Sometimes there needs but two Drops of Water to make some things that were before without the least Action, bubble up, and to put them into a violent motion. If by little and little we pour upon Steel the strongest *Aqua-Fortis*, it will not produce any Motion. But if we mix with the *Aqua-Fortis* only two drops of Water, that Mixture will bubble up in an instant with great Vehemence. Thus too *Aqua-Fortis* with Pewter makes not any Motion; but if we add to it some Drops of Water, it will stir it up to a very violent Ebullition.

These Experiments give us an excellent Idea of the Conflicts and Fermentations that happen in the Earth, when the Rain comes to penetrate it.

Who can conceive the different Combinations that result from the various Mixtures of so many Salts as are dispers'd in the Bosom of the Earth, when the Water comes to dissolve, and put them into a Fermentation? How many different Saps, how many several nourishing Juices must those Mixtures produce for the Vegetation of Plants?

This Sap is a *Proteus*, that takes all sorts of Figures. It changes it self into Leaves, Flowers, Fruit, Wood, Pitch, Gum, and Rosin; and all these things vary according to the difference of Plants, whose Kinds are innumerable. But this is not all; nor, may we so soon leave to enumerate the Wonders, which the Author of Nature never ceases to work in the Kingdom of Vegetables.

If we pursue this Sap in its incomprehensible Filtration through the Pores of Plants, we shall discover its many wonderful Changes. It becomes stinking in Garlick, and in Onions; odoriferous in Pinks and in Jessamin; a deadly Poyson in Aconite and in Hemlock; an Antidote in Anthora, and in Rhubarb; bitter in Wormwood, and Coloquintida; sweat in Sugar Canes, and in Licorish; sharp or styptick in Gooseberries, and in Lemons; cold in the four Seeds of Gourd, Citral, Melon, and Cucumber; Hot in the four Seeds of Annis, Fennil, Cummin and Caraway; Cathartick in Sena, and in Agarick; ptarmical, carminative, sudorifick, diuretick, and what not, in an Infinity of other Plants, whose Names I know not, much less their Virtues.

There is no part of Vegetation, in which the Subtility and Suppleness of the Sap more claim

our Admiration, than in Trees that are grafted. Nay more; in Gardening, and perhaps in Nature, there is nothing comparable to the Art of Grafting. Cicero first ventur'd to say so. *Nec Constitutiones modo delectant, sed etiam Insitiones; quibus nihil invenit Agricultura solertius.* De Senectur.

Without Grafts and Scutcheons our Fruit-Gardens would be of small value. We should be reduc'd to content our selves with the Fruits that Hazard, or the Climate gave us. We should be depriv'd of a world of Pleasures that the Invention of grafting has procur'd us. The wise and retir'd Persons, who go to breath the pure and innocent Air of the Country, find in grafting, and in the Culture of their Trees, the most delightful and most christian Recreation, perhaps of any upon Earth.

'Tis surprizing, that we know not to whom we are oblig'd for a Secret, which is the chief Ornament, and the Riches of our Gardens, and the most Innocent Pleasure of good Men. *Theophrastus* tells us a meer Fable concerning it; the same *Theophrastus*; who first writ of Plants, and who on his Death-Bed so bitterly complain'd of Nature, for having given so long a Life to Stags, and to Ravens, while Mankind liv'd so short a time. This Philosopher says, that a Bird having eaten a Fruit, let fall by chance the Stone of it into a Cleft that was in the Branch of a Tree, and that the Sap of the Tree having join'd it self to the Kernel of the Stone, it fix'd it self to it, germinated, and grew like one of the other Branches. *Pliny* tells us another Story, no more to be depended on than this. He says, that a careful Husbandman pali-

palisado'd in his Garden with Stakes of green Wood; and to prevent the lowermost Ends of them from rotting so soon, he bethought himself to drive them into Trunks of Ivy-Trees, that grew along on the Ground, quite round his Garden. These Stakes, says he, meeting with the living Sap of the Ivys, drew from them a very good Nourishment, and sprouted out as if they had been Planted in the open Ground.

Agricola sedulus casam sapis munimento cingens; quominus putrescerent sudes, limen subdidit ex Edera. At illæ vivaci morsu apprehensæ, suam ex alieno fecere vitam; apparuitque truncum esse pro terra.

Hist. Nat. lib. 17. cap. 14. This is all we know, or rather we shall know nothing of it: for what *Theophrastus* and *Pliny* tells us looks very like Fable.

'Tis certainly true, that a Graft is the Triumph of Art over Nature. By this Secret a Tree changes its Kind, its Sex, its Head, just as the Gardiner pleases. Of an Almond-tree he makes a Peach-tree. He changes the Quince into the Pear. He forces the Thorn to produce Cherries; and the Almond-tree to bear Plums. *Virgil* says more than all this. By this Invention, says he, Men have confounded and mix'd the Kinds of Trees, to make them bear Monsters of Fruits. They have grafted Vines upon Nut, and upon Olive-Trees, that they might have unctuous Grapes. They have grafted Apple-trees on Ash trees and Planes; Cherries upon Lawrels, Chesnuts upon Birch; Oaks upon Elms, and the Walnut on the Hazel. The Philosophers, who were so attentive in contemplating the Works of Nature, were astonish'd to find among the Race of Vegetables,

new Phænomenons, for them to explain. Such are these Master-pieces of Art, who gets the better even of Nature herself, compelling her to give us new Kinds of Fruit: Even to that Degree, adds Virgil, that we see the Swine scratching the Acorns that drop from Elms.

Inferitur vero ex fœtu mœtis arbutus horrida;

Et steriles Platani malos gessere valentes:

Castaneæ fagus, ornusq; incanuit albo

Flore Pyri, glandemque sues frégere sub ulmis.

Georgic. lib. 2.

'Tis the Sap that is the Cause of all these incomprehensible Changes; or rather, 'tis that alone which transfigures and conceals itself under so many different Forms. This Sap in the Trunk of an Almond Tree produces a Fruit that is hard and dry, but so soon as it enters into the Scutcheon of a Plum-tree, that is inoculated into that Trunk, it suddenly changes its original Distination, and forms a Fruit of a tender melting Pulp, of a sweet and sugary Juice, of an exquisite, and sometimes of a perfum'd Taste. This Sap in the Trunk was the nourishing Juice of an Almond; and in the Scutcheon is the next moment the Aliment of a Plum. This Sap, coagulated in the Trunk of an Almond tree, would be an Almond; this very Sap, congeal'd a little higher, in the Graft of a Peach-tree, is a Peach. What a Change is this in so short a space of Time, in so small a distance of Place! By this same Art it is, that the acerb Sap of a Wilding becomes sweet and delicious, by passing thro' the Graft of a Beurre, or of a Bergamot Pear.

Pliny

Pliny mentions a Tree, which he saw at *Tibur* upon which were inoculated so many different Grafts, that it bore at the same time all sorts of Apples, Pears, Nuts, Figs, Grapes, Peaches, &c. he adds, that the Tree did not live long: *Sed brevis fuit vita.* Hist. Nat. lib. 17. cap. 16. *Baptista Porta* says, that he had seen a Tree, which he call'd *the Honour and Delight of the Garden*, where it grew: and that it bore Grapes and all sorts of Cherries without Stones together with Peaches, Oranges and Nuts: and that it always had Flowers or Fruits. *Magia Nat. lib. 3. cap. 19. pag. 164.* *Boyle* tells us that he had seen upon an old Apple Tree, three and twenty sorts of Grafts of different Apples, and that most of them bore Fruit.

All this is wonderful, and inexplicable. However I will do as the Philosophers, and speak like several of them, who will always have something to say upon every subject: For to be wholly silent, would be to act but ill the part of a Man, who undertakes to explain to others what he often comprehends not himself: Hear therefore, what I have to say: When we see that the Sap, which has glided thro' the Vehicles of a Wilding, enters into those of the grafted Branch; we ought to believe, that this Sap, which had dispos'd itself in a certain manner, as it enter'd into the Root of the wild Stock, disposes itself in another manner, when it enters into the Pores of the grafted Branch; which is the Cause that the Fruits are well tasted, and retain nothing of the Acrity of the Savage stock, thro' which the Sap at first pass'd. This was not difficult to find out, and yet it belongs to Phi-

Philosophy. *Boyl. Tentamin. Physiologie. Tentam.*
 2. pag. 42. But shall we say nothing of the Sap of the
 Vine? I mean not that which trickles from it
 when it weeps in the Month of *March*; but that
 which in *September* is the sweetest Pleasure of
 of the Vintage. *P. I. Sachs* has compos'd a
 Volume of above seven hundred Pages, intitul'd
AMPELOGRAPHIA, to describe the Ex-
 cellence and wonders of the Vine. *P. A. Ca-*
nonerius has written a like Treatise upon the
 admirable Virtues of Wine. He omits nothing
 that either the antient or the modern Poets
 have sung, to celebrate the divine Vertues of this
 charming Liquor: But three Words that the
 Author of the Book of *Ecclesiasticus* says of it,
 are more energetical than all that Enthusiasm
 or poetick Fury could inspire into the Favou-
 rites of the Muses. *Wine rejoices the Heart.*
Vinum letificat cor. Ecclesiast. cap. 31. v. 20.
 This says all in little: But *Canonerius* con-
 demns severely the excessive use of Wine, and
 especially blames those who provoke others to
 drink. He declaims with all his Might against
 those drunken Catches, which some, who know
 not how to imploy their Time, compose on
 purpose to excite others to Excess in Drinking.
 He quotes one of them in page 501. which be-
 gins thus:

<i>Quicunque vult esse frater,</i>	<i>Bibat serous cum ancilla:</i>
<i>Bibat bis, ter, & quater</i>	<i>Et pro Rege, et pro Papa,</i>
<i>Bibat semel, et secundo,</i>	<i>Bibe vinum sine aqua:</i>
<i>Donec nihil sit in Fundo.</i>	<i>Et pro Papa, & pro Rege,</i>
<i>Bibat Hera, bibat Herus,</i>	<i>Bibe vinum sine Lege,</i>
<i>Ad bibendum nemo serus:</i>	<i>Hæc una est Lex Bacchica,</i>
<i>Bibat iste, bibat illa,</i>	<i>Bibentium spes unica, &c.</i>

'Tis

'Tis of these sorts of Songs that encourage Drinking, that the Prophet *Isaiah* speaks when he says; *The Lute and the Harp, the Flutes and the Drums, and the most delicious Wines are found in your Feasts; you have no Regard to the Work of God, and you consider not the Works of his Hands.*

Chap. 5. v. 12. 'Tis not enough to know what Sap is; there remains besides a great Difficulty, which 'tis of Importance to explain. 'Tis allow'd by all that the Action of Vegetation is perform'd by means of the Sap; but they are not yet agreed concerning its Motion in Plants. The Antients believ'd that it mounted perpendicularly thro' the fibrous Tubes of the Root and of the Stem, and that thus it convey'd itself to the Ends of the Leaves and Branches. But our Modern Naturalists have discover'd that the Sap mounts and descends several times, before it coagulates and changes itself into any vegetative matter: they call this Flux and Reflux of the Sap, *Circulation*; and affirm that the Sap circulates in Plants, as the Blood does in Animals. *De la Quintinie* contests this Circulation, and says; *I can not imagine either when or where this Circulation begins: and I see neither the Necessity, nor the Use of it.* In Point of Philosophy Men of Honour are not believ'd on their Word: we will therefore bring some undeniable Proofs of this Circulation.

Obfer-

OBSERVATION. I.

The Circulation of the Sap in Plants, explain'd and demonstrated.

WE are convinc'd by several Experiments, that the Juice with which Plants nourish themselves, after having mounted into the Stem and Branches, for their Nourishment and Growth, descends into the Root, that it may mount again with new Juices into the upmost Parts of the Plants: and this Motion is what makes the Vegetation; because in this Circulation the Juices Subtilize and coagulate themselves, take a Consistency, and become a solid Body by corporifying themselves with the Plant. The Naturalists call this Motion *Circulation*; because the Sap circulates in Plants almost in the same manner, as the Blood circulates in Animals. *Harvey* first discover'd the circulation of the Blood in Animals; and *Malpighius* the Circulation of the Sap in Plants. The Experiments on which this Opinion is grounded are these.

EXPERIMENTS.

I. **P**luck up a Plant roots and all, and put some of the Roots only in Water: you will find that the roots which are not in the Water, will nevertheless keep themselves alive and grow: which they could never do, if the Water which rises into the Stem, did not fall down, and impart itself to the Roots that are not in the water. Therefore there are
Vehi-





A Tree cut off at the Root

Vehicles in Plants, to reconvey towards the Roots, the Juices that were mounted up into the Stem. Now this Motion of mounting and descending to mount again, is what we call Circulation.

2. When we cut off the Bark from certain Trees, we find that the uppermost part of it is thicker and better nourish'd than the lowermost. The Reason whereof is, because the Juices, as they return towards the Root, find themselves stopt there, nor can go any farther, by reason of the Solution of Continuity, which they meet with in that Place. Therefore the Sap descends, and by consequence there are Vehicles open to reconvey it from the Stem to the Root.

3. It has been observ'd of milky Herbs, for Example of the Sea-Spurge, that if we bind them hard with a Packthread in the middle of the Stem, there will be a Tumour and swelling above the Ligature. Which could not be, if the Juices that rise up from the Roots, did not return thither, and were not stopt in their Return by the Ligature.

4. When we can by chance find a Tree, whose Trunk grows from two great Roots, one of which is uncover'd about a foot and a half, we may make an Experiment that will undeniably prove the Circulation of the Sap. We cut the Root that lies naked to within four Inches of the Ground, so that the Solution of Continuity may hinder the Juice from mounting, and from imparting itself to the Top of this Root, and to the Trunk. Nevertheless the year following, that part of the Root, which remains join'd to the Trunk, will shoot forth

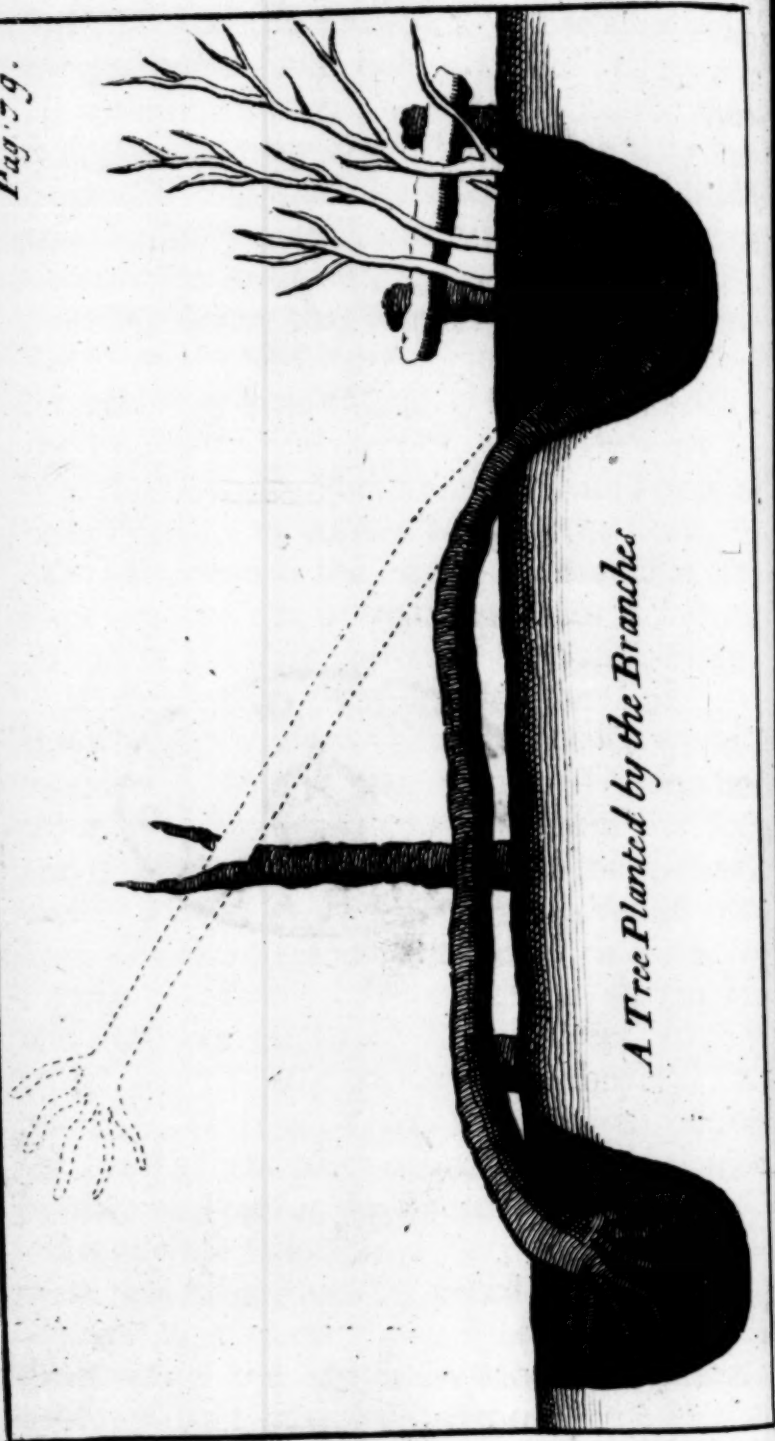
forth Leaves and Branches. This Production cannot come from below, because there is no Communication with the Earth: it must therefore proceed from the Juices, which flow back from above toward the Roots. And this Flux and Reflux of the nourishing Juices is the Circulation in Question.

5. We know that the Sallow, the Vine, the Birch, the Osier, the Goosberry-Bush, and several other sorts of Plants, shoot out Roots at the End of their Branches, when they are laid into the Ground. There are therefore Pores and little Vehicles to convey towards the Root, the Sap that enters at the End of the Branches. This Experiment leads us to others, that are strong Proofs of the Circulation of the Sap in Plants.

If we lay in the Ground the End of a Branch of any of the Trees or Shrubs we have mention'd, it will take Root. If afterwards we cut off this Branch intirely from the Tree, and stick the other End of it into the Ground, that End will take Root likewise. While both Ends of it are thus in the Ground, it forms the Figure of a Bow; cut the Bow in the middle and you will have two distinct Trees, each of which has a Root: which proves beyond Dispute, that there are Vessels from Top to bottom for the Descent of the Sap, as there are from bottom to Top for the Ascent of it.

Upon this Principle a very curious Experiment was made, and succeeded to Admiration. 'Twas this, Cut off the End of the Root of a Tree, when the Sap is in Motion to mount upwards, and it will distill more Juice by that Root, than at the end of a Branch, cut off towards the Top of the Tree. The reason of which





A Tree Planted by the Branches

which is evident; because as there mounts a greater Quantity of Juice above the Root cut off, so proportionably more too will fall down; and by consequence the Evacuation will be greater at that Amputation.

It will perhaps be thought that Philosophers only meddle with these sorts of Experiments, and that none else concern themselves with them; but we have an Instance of the contrary in the Persons of the Elector and Electress of Brandenburg, who took great Delight in seeing the like Experiments made in their own Lands; where this, of which we were speaking, of planting the uppermost End of the Branches of Trees, has been much improv'd. For *Constantinus Hugenius* teaches us, that they had carry'd these Experiments so far, as to Plant whole Trees, the Branches downwards, and the Root upwards; and that those Princes often diverted themselves to see [a Metamorphosis unknown to the Antients] the Branches change themselves into Roots, and the Roots become Branches: which he thus explains in his Letter of December 17. 1686. to *Leenwenhoek*.

I cannot, Sir, sufficiently praise your indefatigable Industry to discover Secrets in Nature, which were but little known to the Antients. Have you ever heard of Trees planted upside down, so that the Roots are next the Sky, and grow out into Branches. This is perform'd on Linden-Trees. My Gardiners have not been able to bring it to pass; but I know it has succeeded; and I have Authors too considerable to doubt of the Truth. I mean the Elector of Brandenburg, and his last Wife, who being here some years ago, assur'd me, that they had in their own Lands several of these inverted Trees,

Trees, and that they thriw'd much better than the other. Nescio an unquam noveris plantare Arbores inversas; adeo ut Radices sub Cælo in ramos excrescant. Tiliæ dico. Hactenus Hortulani mei id efficere non potuerunt. Sed ejus rei Auctor nimis gravis est, quam ut de ea redubitem. Is nempe fuit ante aliquos annos serenissimus Elector Brandeburgicus, qui huc venerat cum posteriori sua uxore: quique ambo serio mihi affirmabant, multa se earum arborum experimenta in provincijs suis habere, quæ latitudine multo præ cæteris eminebant, &c.

Leeuwenhoek communicates this Letter to the Royal Society of England, and gives them an Account of the Experiments he himself had made for Twenty years past, on the Vegetation of these inverted Trees. In the Month of April 1686. I made my Gardiner, says he, plant a Linden in this Manner. The Root was in the Ground, but not deep. The Branches and the Head of the Tree were there likewise, and to hold them fast down, we made use of Hooks of Wood. In this Situation my Linden was at the same time planted at both ends; and the Trunk lay about four Inches from the Ground. In April 1688. I found that the Branches had shot out many Roots. I cut all the Branches two Inches in the Ground; and having pull'd up the Foot of the Tree, where the old Roots were, I rais'd it upright in the Air, and supported it with a strong Fork, that the Wind might have no Power over it. The 26th of May, I was pleas'd to find that the old Roots had sprouted out above a hundred Burtons; some of which being already open, form'd green and beautiful Shoots. Since that time this Linden being us'd to that Situation,

per-

performs all the Duties of a good Tree; having, as I may say, willingly submitted that its first Roots should become new Branches, and that its old Branches should change into new Roots. This was the Metamorphosis it made; and if this Experiment does not demonstrate, that there are fibrous Tubes in Trees, for the Sap to mount and descend equally, I know not what Demonstration is in matter of Physics.

Thus we see that the Sap circulates in Plants; so that the same Juice passes several times thro' all the Plant, going from the Root to the Branches, and returning from the Branches to the Root, thro' Vehicles, which the modern Naturalists term *circulatory*, some of which serve to convey the Sap that rises, and the others to reconvey that which descends.

Experience has convinc'd us that these circulatory Pipes are in Effect of two sorts, as is Demonstrated by the following Experiment.

EXPERIMENT.

IF we take a small Branch of an Elm, and cut it so as to fit two Tunnels to its two ends; we shall find that the Water which we pour into the Tunnel at the uppermost End of the Branch, will pass thro' and fall down very well. If we pour in afterwards any Spirit of Wine, it will not pass at all. On the contrary, if you pour Spirit of Wine into the Tunnel that is at the lowermost End of the Branch, it will work it self in perfectly well, and convey it self thro' the little Vehicles, by which the Juice mounts from the Root to the Branches: and if

G

you

you afterwards put in any Water, it will not pass at all. Which evidently proves that the Juices, which mount from the Roots to the Branches, are very subtile and full of Spirits: and that the Juices which descend, to be again concocted, digested and sublimated, are more gross and aqueous.

When we are thus acquainted with the Motion of the nourishing Juices, we shall be able to give the Reason of certain surprizing Phenomenons, that may be observ'd in Plants, and that have given so much trouble to Philosophers. Among these I place what is vulgarly said, that there are Plants that love one another, and that take Delight in growing together; while others hate one another, and cannot suffer each others Neighbourhood. This the Naturalists, who liv'd in the Days when Men gave not themselves the trouble to enquire into the Nature and Reason of things, plac'd among the occult Qualities, and call'd it *Sympathy* and *Antipathy*. But now we have discover'd the Nature of the Sap, and the circulatory Vessels, by which it mounts and descends, 'tis easy to Philosophize on this Subject. As for the Discoveries I mention'd, we are oblig'd for the Knowledge of them to the learned *Malpighius*, *Redi*, *Ray*, *Grew* and *Leeuwenbeck*; and they in a great Measure to the Help of their Microscopes.

OBSERVATION II.

Concerning the Sympathy and Antipathy of Plants.

THE antient Philosophers said many weak things concerning the mutual Love, and reciprocal Aversion of Plants. They always had Recourse to the pompous Terms of *Sympathy* and *Antipathy*, as to a specious Asylum, to shelter and conceal their Ignorance. According to the Naturalists there are some Plants that love one another, and that live together with all possible Delight: and others, that cannot suffer one another, and whose Neighbourhood is alike destructive to either. My Lord Bacon, Chancellor of England, laugh'd at these pretended Aversions, and imaginary Friendships: the whole Mystery of which, according to that great Man, is no more but this. Two Plants, who nourish themselves with the same sort of Juice, hurt each other extreamly by too near a Vicinity. To share between them the Food that was sufficient but for one, throws both of them into a languishing condition. *Obest vicinia, alterâ alteram fraudante.* And this is the *Antipathy*. On the contrary, two Plants, that require for their Aliment, Juices that are wholly different, vegetate and flourish together perfectly well. *Plantæ indolis non unius, & succo diverso alendæ, amica conjunctione gestiunt.* And this is the *Sympathy*. *Sylva Sylv. Cent. 5. n. 480, and 481.*

But the Mystery being thus unvail'd by so plain an Explication, Philosophy is brought down to the Capacity of all Men; its Credit

diminishes; and with the common People it loses the Respect due to it. Be it as it will: let us proceed and say, that according to *Bacon's* Principle, there is a Sympathy between a Fig-tree and Rue. They never quarrel about their food. The Juice that agrees best with Rue, suits not the Fig-tree's Palate. And therefore that good Intelligence between them will last for ever.

There is a Sympathy between Garlick and Roses. A Rose requires an odoriferous, and Garlick a stinking Juice. Nothing therefore can hinder the Rose from thriving in the same Ground with Garlick: the last of which will not make War with the first to rob it of its Sustenance. Nay more; when the Rose has Garlick for its Neighbour, it produces fairer and sweeter Flowers.

On the contrary, there is an Antipathy between Rosemary, Lavender, the Bay-tree, Thyme and Marjoram, which when planted together cannot but much impair and prejudice one another; because they all require the like nourishing Juices; thus when they are Neighbours, they starve one another, and visibly fall into Decay.

There is a raging Antipathy between Cabbages and Cyclamens: between Hemlock and Rue, and between Reeds and Fern. These Plants bear so terrible a Hatred to each other, says the Jesuit *Kircherus*, that two of them cannot live together in the same Ground. Their Conflicts are so obstinate and cruel, that one of the two must perish; and often both one and the other of them wither in an Instant, and die away for Grief: *Adeo sævas Luctas ineunt, ut u-*

trum

trunque viribus destitutum marefcens contabefcat. Art. Magnēt. lib. 3. cap. 2. pag. 494. This is what we call an irreconcilable Hatred. Who could believe there was ſuch Animofity and ſo deadly a Difcord among the Race of Vegetables. Philoſophers perhaps ſometimes put on the Buſkins of the Poets to puff up and ſwell their Style. This learned Jeſuit gives the reaſon of the Deſtruction of the Plants that hate each other, which is, ſays he, becauſe there exhales from the Body of certain Plants a Vapour, a Steam, an ill Breath, which is diſpleaſing and nauſeous to the others; and that when a nice and tender Plant has the miſfortune to be within the Reach of the noiſom ſmell of a ſtinking Plant, it fades immediately; and loathing it, dies away: *Plantæ enim, ſive vapore, ſive exhalatione certas quaſdam Sphæras cauſantur, intra quas aliæ conſtitutæ alterant.* Thus he explains the Antipathy of certain Plants. But I am rather of Bacon's Opinion, who aſcribes the Ruin of ſuch a Plant to its Neighbour's robbing it of an Aliment of which it had need. *Gemini enim prædones terram inſident in mutuam perniciem. Simile quid dicitur de Arundine atque Filice, utraque ſucculenta, alteraque alteram fruſtrante. Idem de Cituta & Ruta, quas vehementes ſucci trahaces vocare liceat.* Centur. 5. n. 492. This is ſaying ſomething; with which right Judgment and ſound Reaſon are ſatisfy'd; and by it the big Words of Sympathy and Antipathy are brought to nothing. There is no more Antipathy between two Plants, than between a couple of Maſtiſſs, who fight and worry one another for a Bone, that each of them has a Mind to have. The occult Qualities of the Pe-

ripateticks, or to use the Expression of Kircherus of the Philosophical Populace, *ut Plebei Philosophi opinantur*, have nothing to do with the Matter. Every one understands this Philosophy of Bacon, because true Philosophy is easily understood by all the World. And indeed why should it not? Seeing, as Sr. Anthony said very well, the great Book of Nature, which contains but three Leaves, the Heavens, the Earth, and the Sea, is open for all Men alike.

U S E.

That we may end our Observations with something useful and practical, we say after Bacon, that whoever would have the Plants of his Garden to thrive well, ought to avoid placing together such as nourish themselves with the same Juice. Thus I would never Plant the Aromatick Plants in the same place. The Cathartick should not be together. I would part the bitter, unless I had a mind to make Tryal, if I could not, by having them together, increase or diminish, their good or ill Qualities. This Thought of Bacon's opens the way to a great Number of very curious Experiments for Gardening, that might be of use and advantage to Physick. *Evites oportet herbarum viciniam eodem gaudentium suco. Sin efficaciam herbae extenuare libeat, consultum alias ejusmodi in proximo jungere, ut exilesceat virtus.* Cent. 5. n. 489.

Observation

OBSERVATION. III.

The Motion of the Sensitive Plant explain'd:

TIS reasonable to believe that *Campanella* never heard of this Plant, which is likewise call'd the *Chast Plant*, because 'tis no sooner touch'd than it folds up its Leaves, moves itself hastily, and seems to fly away. If he had known this Plant, he wou'd not have fail'd to have call'd it, not only a *Zoophyte*, that is, a Plant-Animal, but even a very Animal in all its Forms. He wou'd have triumph'd; and *Aristotle*, and the *Peripateticks* must have been undone for ever.

Before we enter upon explaining the Motion of the *Sensitive-Plant*, we must confess, that the Task is not easy; and that when we have done our utmost, all we can say of it will fall far short of Demonstration. We are convinc'd within our selves, that this Plant has no more sense than a Cabbage: but Nature has conceal'd from us the Cause of the suddain Motion of this Plant, upon the least Touch; and why the same thing does not happen, when we touch a Cabbage, or any other Plant.

This being premis'd, we must observe, that not only the several sorts of the *Sensitive Plant*, but even several Leguminous Plants that have opposite Leaves, as the *Sensitive* has, seem to wither at the least Cold. During the Cool of the Night, they join and fold in their Leaves, till the Sun, being return'd on the Horizon, has warm'd the Air. This is literally true of the *Sensitive*, which all this Summer I have

call'd the *Lazy Plant*, because it never opens its Leaves till some time after Sun-rising. This Plant is more or less wither'd, as the Night is more or less cold. 'Tis in the same Condition in Broad Day, if we do but touch it. Its Leaves seem a little faded, and clos'd up in a mournful Manner, just as we see them every Night. Thus the Cold and the Touch produce the same Symptoms in this Plant. Either of them dries, and makes it contract its Leaves; and both produce the same Contraction, or shrinking of them up. Therefore if we can but discover how Cold is the efficient Cause of this Motion, of this Contraction, and of this sort of drying away, 'twill be a means of helping us to know how the Touch, either with the Hand, or with the Help of a Stick, can work the same Effects, which we behold with admiration as often as we touch this Plant.

I imagine that the *Sensitive* being truly a Plant of so very a nice and tender Complexion, that the least sharpness of Cold nips and pinches it to death; as they who give themselves the Trouble to raise up the Seeds of it, know very well; it must necessarily follow that the Cold contracts its Pores and its Fibres; so as to make the vaporous Juice, that maintains and preserves the beautiful Verdure of its Leaves, retire, and drives it down towards the Root.

This Juice, which fill'd and swell'd the circulatory Vessels, being dissipated, the Plant must undergo the same Fate, which towards the End of Summer, for want of proper Juices for its nourishment, never fails to overtake it; its Leaves must wither, contract, and close themselves up. Thus when we read before a Fire,

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we see the Cover of a Book drawn back, for want of that Moisture, which the Fire has dissipated.

If this Contraction of the *Sensitive-Plant* destroy the Structure of its Pores, and the Disposition of its Fibres, so that the Juices, which are driven down towards the Root can rise again no more, nor return to their usual Channels, the Plant dies; as it must always do the first sharp Nights in Autumn.

I am of opinion that the same thing happens when we but touch the *Sensitive*: the Motion and shaking of the Stem and the Leaves make the Juices retire towards the Root. And indeed we may observe, that merely to touch them will not always produce this Effect: we are very often oblig'd to strike the Plant something smartly, so as to make it shake very much, otherwise the Juices will not evacuate the Pores. The suddain Retreat of the Juices causes the contraction of the small tubulary Vessels, and by consequence occasions the drying of the Leaves, and the Motion by which they shrivel up; till some few moments after, when the Juices rise up again, the Leaves unfold as before, and recover their former Vigour.

Ray Argues on this Subject much after the same Manner. Sense, says he, is so far the Lot and Portion of Animals, that Philosophy makes it their Specifick Distinction. Nevertheless there are some Plants, in which we observe a lively Appearance of Sense. These sorts of Plants we call *Sensitive*, *coy*, and *chaste*, because they turn aside and retire as soon as they are touch'd: from whence some have concluded, that all Plants are not void of Sense: and by refusing to grant their Assertion, we put ourselves

selves to a great nonplus: For how can we explain in a mechanick Manner this all-surprising Motion of the *Sensitive-Plant*? Is it not exactly like the Motion of the Lungs, which extend and dilate themselves, when they are fill'd with Air, and fall and contract themselves, when the Air is breath'd out? The cold Air causes the Leaves of the *Sensitive* to fold up: perhaps because it drives back the Juices, and compels them to return towards the Root. Is there not all the Appearance imaginable, that he who touches the *Sensitive-Plant*, compresses and squeezes together the little Vehicles that convey the Juice? And then the Leaves, the Branches, and even the Stem itself, being drain'd of the Matter that fill'd them, must contract themselves and wither away. And this is all the pretended Chastity of this Plant. *Fi-
eri enim patet, ut tam digiti, quam ambiens fri-
gus, spiritus contrahat, & condenses, eorumque
motum sistat; adeoque folia contrahit, & collapsi-
cere faciat.* Hist. Plantar. lib. 18. cap. 2. pag.
978.

We see a like Phenomenon in the *Rose of Fericco*: when 'tis full of Juices 'tis more open than Plants commonly are: when the Humidity is evaporated, it closes and curls itself up in a surprising Manner. When 'tis quite shrivell'd up, put the Root into lukewarm Water, 'twill open, unfold, and dilate itself again, proportionably as the Humidity reascends by its Pores into all its Branches. If this can be brought to pass so soon, in a Plant that has been Fifteen years dry, as my *Rose of Fericco*, on which I made the Experiment has been, it ought to happen much sooner in a living Plant.

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the Conformation of whose Parts has not been intirely disorder'd and confus'd by lying dry so long. They who are not accusom'd to these Physical Speculations, find it difficult to give credit to these so suddain Motions and Changes in Plants, we will therefore endeavour to convince them of the Truth of it; and make their own Eyes the Judges whether we trifle with them or not. Let them try the following Experiment borrow'd from my Lord Bacon.

EXPERIMENT.

TIS not to be imagin'd how much Alteration and Motion a little Moisture causes in a Plant, that is even dead and out of the Ground. We must see the Experiment before we can believe it. And, says Bacon, we will take it from Jugglers, who show Legerdemain Tricks, and are much admir'd by the Vulgar, who are easily impos'd on. 'Tis this. When any thing is lost in a Family, and any one is suspected to have taken it, the following Stratagem is made use of, to make him confess the Fact, and restore what is lost.

They take the Beard of a wild Oat, while 'tis yet greenish, and twist it in the Shape of a little Cross, which they give to the Person they suspect, and of whose Guilt they ought to have so strong a Presumption, as to hold Place of Evidence and Demonstration. They give likewise to the rest of the Family little Crosses, but made of Wheat or Rye-Straw, or of Hay: so that all the Crosses be near like one another. Then cutting a Pear or an Apple

ple into halves; they bid every one stick his Cross into the Apple, declaring that his who did the Theft, will turn round several times. That they may thrust them in the more easily, they make a Hole with a Pin, where every one has a mind to stick his Cross; and each is at liberty to chuse the Place he pleases. No sooner are the Crosses stuck in, than the little Beard of wild Oat, growing Sensible of the Moisture, begins to move, untwists itself, and turns round several times, to the great Astonishment of the Spectators. *Sylva Syl. Cent. 5. n. 494.*

I have not exactly translated *Bacon*, but have rather put another Experiment in the Place of his, which is confus'd, intricate, obscure, and capable to give credit to the Superstition.

The Virtuoso's make use of this Oaten Beard, to serve as a Hand, or Needle to their Hygrometers, which are little Instruments made like Dials, to shew the several Degrees of the Moisture and Dryness of the Air.

CHAP. V.

The Method of drawing the Juice from Plants: and the Uses of it.

THE Juices of Plants are one of the richest Fonds of Physick. Minerals and Animals are not of so great Help to it; and supply it not proportionably with Remedies against the different Diseases to which Men are subject. These Juices, which are the Blood of Plants,

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have something in them of the Juices of the Earth, by which they are nourish'd. Accordingly it has been discover'd, that there are Juices, 1. Aqueous, 2. Vinous, 3. Oleaginous, 4. Gummy, 5. Resinous, 6. Bituminous. There are of all sorts of Colours. *Fernelius* who follows the Ancient Physicians, will admit but of nine different Savours. *Sapor Acer, Acidus, Pinguis, Salsus, Austrus, Dulcis, Amarus, Acerbus, Infipidus.* *Fernel de Medicam, Vir. Lib. 4. c. 3. p. 347, 348.*

Pliny reckons up fifteen sorts of Tastes in Juices. Water, he says, can not be good, if it have any. *Sentiri quidem aquae saporem nullum, succumve, vitium est.* *Hist. Nat. Lib. 15. cap. 27.*

Grew goes farther, and finds in Plants sixteen sorts of Tastes, which *Ray* carefully gives us

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| 1. Bitter, as Wormwood. | and the Leaves of wild |
| 2. Sweet, as Sugar. | Cowcumbers. |
| 3. Acid, as Vinegar. | 12. Stupefactive, as the |
| 4. Salt, as Nitre. | Root of Hellebore. |
| 5. Hot, as Cloves. | 13. Astringent, as Gall- |
| 6. Cold, as <i>Sal Prunella.</i> | Nuts. |
| 7. Aromatick, as the Root | 14. Pungent, as <i>Sal Ar-</i> |
| of the <i>Florence Iris.</i> | moniack. |
| 8. Nauseous, as Rhubarb. | 15. Intermittent, as the |
| 9. Vapid, as the White | Root of Dragonwort, |
| of an Egg. | whose Action ceases, |
| 10. Unctuous, as Oil. | and then begins again. |
| 11. Penetrant, as the Root | 16. Tremulous, as the Root |
| | of wild Pellitory. |

Ray, who despises the Signatures of Plants, as being of no help to the Discovery of their Virtues, lays, on the contrary, a mighty Stress on

on their Savours, which he regards as certain Means to discover their specifick Qualities; and says, we cannot study them too much. *Hist. Plant. lib. 1. cap. 24. pag. 47. &c.*

He observes very well, that Jalap, Mercury, and the white Daisy, that have the same Savour, have likewise the same Cathartick Virtue. From thence he concludes, that Plants whose Savours are different, have not for certain the same Qualities; and that there is as much Difference between their Virtues, as there is between the Savour of Rhubarb, and the Savour of Bloodwort. Thus he has open'd a Way to make a farther Progress in the Knowledge of the Natural Qualities of Plants.

1. These Juices strain out of their own accord, and coagulate into Gum, as Myrrh, Bdellium, Tacamahacca, Storax, Benjamin, the natural Balm, and all Gums.

2. Sometimes the Juices come out by an Incision made in the Bark, that they may be afterwards dry'd in the Sun; as are the Juices of Scammony, Aloes, Poppy, &c.

3. Sometimes the Juices are got out by Confusion and Expression, as the Oleaginous or aqueous Juices, that are drawn from Leaves, Flowers, Fruits, or Seeds.

4. Juices are likewise extracted by the Help of Fire, when the Parts of the Plants are dry. And this is done by the addition of some Liquor to the dry Plants.

5. There is a fifth way of drawing out the Juices; particularly the Juices of Trees, which is by *Terebration*; that is to say, by piercing the Trunk of a Tree with an Awger, when the Sap, at the Entrance of the Spring, begins to rise.

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Of this last manner only we intend to treat. I believe it was unknown to the Antients; at least I have not found that any of them have made mention of it. If so; we are oblig'd to the *English* for this Invention, which is of great Use.

My Lord Bacon speaks of this Terebration or Tapping of Trees; but he proposes it only as a Remedy to render them more fruitful; and therefore he compares it to letting of Blood. There are, says he, several Advantages in tapping the Trunks of Trees: it frees them from an Excess or Repletion of Juices, which is prejudicial to their Fruitfulness. Besides, this Operation by which the useles and ill-digested Juices are evaporated, ought to be regarded as a kindly Sweat that will much contribute to render the Fruits better tasted. 'Tis not an Abundance of Blood, that causes the Health of Animals, and procures them a good Habit of Body. Too much Nourishment will overcharge: and cause mortal Obstructions. The Terebration of Trees is a healthful letting them Blood: and helps them to evacuate only their superfluous and useles Juices. A Plethory of Humours is a great Disease. By the Tears that trickle from the Vine, it purges it self of the too great Quantity of Humours, that would drown the Plant; and frees it self of them, that it may retain only the Juices, that are well-cooked, well digested and sublimated: such as we taste in ripe Grapes, or in the delicious Liquor extracted from them in due Season, according to the Rules of Art. *Observatio de Arboribus perforandis, & sic feliciore illis Incremento. conferendos; quae fructus quoque suaviores, melioresque testatur; rejecta*

rejectione per sudorem viliori inutilique succo: Quod fructibus Terebratio arborum est, illud sanguinis missio, &c. Sylva Sylv. Centur. 5. n. 463. 464. pag. 249.

But as new Discoveries are not brought all at once to their Perfection, the first Designs of *Bacon* have been much improv'd. It cannot be deny'd, but that the Royal Society of *England* have brought this *Terebration* to such Perfection, that they have left other Naturalists no possibility of advancing it any higher. Their Genius, that is so proper to discover new things, and to bring them to Perfection, makes them try all ways that can be imagin'd, to make their Discoveries at once pleasant and useful. Of this the *Terebration* of Trees is a manifest Proof. They have brought it into Rules, and reduc'd it into Method. In short, they have found these Juices, that are extract-ed by this Methodical *Terebration*, to be of great Use.

The Method to be observ'd in it, according to *Dr. Tong*, is as follows: There are, says he, different Manners of extracting the Juice from Trees. If you would draw out a great deal, 'tis not sufficient to make a slight Incision in the Tree with a Knife: you must pierce the Trunk on the South side, go quite thro' the Pith, and never stop till you have bor'd to within an Inch of the Bark, on the North side. You must guide the Awger, in such a manner, that the Hole may all along be sloping upwards, that the Sap may the more conveniently run out.

The Hole ought to be made near the Ground; That the Trunk of the Tree may not be spoil'd:



A Tree tapp'd to extract y^e Juice



spoil'd: and 2. that you may not have need of a long Pipe, to convey the Sap into the Vessel that is to receive it. *Act. Philosoph. Aprilis 1669. pag. 51.*

A Root, cut at the End, yields more Liquor than a Branch: because there rises up more above the Root, than above the Branch; and consequently the Effluence will be the greater.

'Tis probable, that the nearer the Trees are arriv'd to their Perfection, the more Sap will distill from them.

The Time of Tapping the Trees to draw out the Liquor is from the middle of *January* to the Middle of *May*. A Walnut-Tree must not be tapp'd till the end of *March*. *Misford of Durham*, who took great pains to collect and preserve the Juices of Trees, assures that the Poplar and the Ash over-flow with Sap from the fifteenth of *March*; and that the Sycamore will yield Liquor, even in frosty Weather; in-somuch that the Drops will freeze as they distill from it. *Act. Philosoph. Januarij 1669. pag. 15. & 16.*

Trees yield no Liquor in Autumn; and in Spring, not longer than a Month. When the Spring is too dry, we can draw but little Sap: When too wet, there distills no more than can rise through the Pores of the Trunk. *pag. 18.*

The *Terebration*, or Tapping of Trees is perform'd with most Success at Noon in the Heat of the Day; because the Juices are then most in Motion. The Heat makes the Sap mount. 'Tis a Limbeck made by Nature, and the Artificial are only Copies of it.

The Trees that yield much Juice are the Poplar, the Ash, the Plane, the Sycamore, the
H Willow,

Willow, the Birch, the Wall-nut, the Oak, the Elm, the Maple, &c.

Ratray, the learned Scotchman, says, that he knows by his own Experience that one may in the Spring extract from a Birch as much Sap, as the Tree itself weighs, together with its Branches, Leaves and Roots. *Ratraius doctissimus ille Scotus, affirmat se propria experientia computasse succum, qui ex Betula verno tempore extrahi potest, tanti esse ponderis, quanti tota est Arbor simul cum ramis, & radicibus.* Acta. Philosoph. Januarij. 1669. pag. 3.

This Tapping of Trees led Dr. Harvey to the Punction or Pricking of Plants. He found the secret of Drawing from the Heads of Poppies the Best *Opium* that ever was. His Method was, to expose to the Sun for some Hours, the Plants intire: then he prick'd the Heads of them, and in a little time drew a Silver Porringer full of the Juice of Poppies, which is the true *Opium*, and cannot be valu'd as it deserves. Philosoph. Transact. Januar. 1669. p. 4. They who know in what a Condition the *Opium* comes to us from Greece and from Egypt, set a great Value on Harvey's. Lemery observes that the true *Opium* never comes to us: because the Foreigners who draw it from the Heads of Poppies, keep it for their own Use, and send us only the *Meconium*, which is a Juice, squeez'd out by Expression, and which they thicken, to facilitate the Transport of it. *Meconium* is much inferior in its Operation to *Opium*, and mixt with many Heterogeneous and impure Parts. For which reason the Chymists make an Extraction of it, which they call *Laudanum*. This is Lemery's Opinion of it, in his Course of Chymistry.

Chymistry. Part. 2. Chap. 22. page 585. Charas says the same thing: The Difficulty we find in getting an *Opium* that distils of itself, without any Mixture, and the Impurities that are observ'd in the *Opium*, that is brought from abroad, which properly speaking is only *Mecconium*, or a Juice squeez'd from the Heads of Poppies, have put our Chymists upon finding out Ways to purify it. Thence we see, of how great advantage it would be to bring to Perfection what we call the *Terebration* of Trees, the *Punction* of Plants, and the Pruning of Vines: seeing thereby we shou'd extract wonderful Juices, that wou'd no doubt be of great Use in Physick, and perhaps serviceable for the Necessaries of Life, as we are about to shew.

It cannot be doubted but Physicians would find in these Juices very efficacious Remedies for the Health of Men. What we have already seen in relation to *Opium* is an undeniable Proof of it. And the Experiment that has been made on Poppies, might likewise be put in Practice on the male Peonies, and on several other Plants, whose Vertues are highly esteem'd. What a World of Advantages would this procure us? We should thereby be masters of all that is most essential, and most operative in all Plants. We should extract from them the Gums, the Rosins, the Tinctures, the Salts, the Odours, &c. Nothing could escape the Curious, and the Diligent, we should endeavour to heap up a Treasure of all the most valuable Faculties of Vegetables, against the many Diseases, that destroy Mankind. *Id etiam in Peonia mascula, & reliquis stirpibus minoris famæ, & virtutis tentari possit, tam ad Gummata, colores, odoras, &c. obtinenda,*

*quam ad nobiles succos inde extrahendos. Act Philo-
soph. Januarij. 1669. pag. 4.*

The Juice of Oak is a Sovereign Remedy to stop the Blood, that passes the same way as Urine. The Juice of Elder is above all Praise, to prevent, or to heal the Dropsy. This Method will teach us to do, all that Limbecks and the painful Art of Distilling could never arrive to. We shall extract the Spirit from Plants, not when they are wither'd, macerated and bruis'd to pieces; but when they are full of Life and Vigour; and then how great will be the Advantage we may reasonably hope for from thence? *Act. Philoso. Januarij 1669. pag. 4.*

The following Experiment deserves to be known. The Secretary who writes the Philosophical Transactions of the Royal Society of England, says in express Words: I had the Itch in my Hands, and sometimes in my Arms, that gnaw'd and devour'd me even to the very Bones, to the shame of several able Physicians, my Friends, whose Remedies, Bleedings and Purgations never did me the least Good. This inveterate Disease was cur'd in a few Days with no other Remedy then Plum-tree-Gum, dissolv'd in Vinegar. I will not omit, that some Days before I made use of the Gum, I apply'd now and then Vine-Leaves and Grape-Seeds pounded together, which drew from my Ulcers the Humour, that tormented me. *Philosoph. Transactions, January 1665. pag. 5.*

Neither may we pass over slightly what some learned *Englishmen* have said concerning the Juice of the Walnut-tree: The Tree, which nourish'd the first Men in the golden Age, that is to say, in the happy Days the of Simplicity and

Innocence of Mankind. The Antients speak with great honour of this Tree. They tell us 'twas sacred to *Jupiter*, and that the Nuts were his most delicate Food. *Juglans, quæ Jovis Glans.*

After this we need not wonder that the good Taste of the Antients has been renew'd in our Days, and that a certain great Person wou'd eat the Mefs that *Jupiter* had fed on before him. The Royal Society of *England* assures us, that in our Days there was a King in *Europe*, who for a long Time drank the Juice of Walnut-trees, and that he found great Relief by it in his Infirmities. *Addito Exemplo cujusdam Regis moderni in Europa, qui multum succi Inglandis bibit; indeque multum commodio sentire. Act. Philosoph. Octobr. 1668. Tom. 4. pag. 340.* For these Reasons the Gentlemen of that Society earnestly desire all that will well to the Common Good, to do all they can to perfect the Secret of the Terebration of Trees, in order to extract the Juices, which are certainly of great Use, as well for the Preservation of Health, as for the Recovery of it.

Seeing I have philosophiz'd so much on the Juices, I will venture to set down a Thought of my own. Some Learned Persons are of Opinion, that the *Manna* of *Calabria*, and of *Syracusa*, are only the Transudation of a Humour that breaths out of Ashes and Larch-Trees. If this be so; might we not by Terebration extract the Juices of these Trees in the Month of *March*, and easily make a great Quantity of this *Manna*, which is taken out of them in little pieces only, either by or without Incision in the Months of *June, July, August and September*?

I believe the Sap condens'd, would be same thing as the Manna. *Tournefort* dissents not much from this Opinion, and an Experiment he made, favours my Conjecture. He relates it thus. Some years ago I took care to wash a great Quantity of Lime-tree Leaves, which grew in the great Walk of the Royal Garden, in a Pail of Water till I had made it very sweet. I caus'd it to evaporate to one Half, and then made a sick Person of the Parish, who had need of being purg'd, drink three Glasses of it. This Potion operated as well as a common Laxative Pilsan. This confirm'd me in the Opinion of *Angelus Sala* & *Bartholomæus ab urbe veteri*, who first of any, that is to say, in the Year 1543, asserted, that the Manna of *Calabria* falls not from Heaven, but that it transpir'd thro' the Leaves of the round-leaf'd Ash. And I believe we may assert that the Manna we are speaking of, is only the essential Salt of the Ash, mixt with a considerable Quantity of Sulphur. The Manna of *Briancon* is only the Essential Salt of the Larch, mingled likewise with Sulphur. *Memoires de l'Academ. des sciences*, 1699. pag. 101.

Reneaume has likewise discover'd the Matter of this *Transudation*, or the Juices that transpire thro' the Leaves of Maple. In the History of the same Academy, we read these Words. *Reneaume* found on the Leaves of a sort of Maple, *Acer montanum candidum*. C. B. P. a viscous humour which could be nothing but a plain Transpiration from the Plant. 'Twas of a more pleasant sweet than Manna, and approaching to Sugar. Some Authors have spoken of the Juice, drawn by Incision from the Maple in the

the Spring, and have known it to be good to drink, and to have a Taste something like Sugar. *Histoire de l'Academ. des sciene. 1695.-pag.65.*

In Confirmation of what *Reneaume* says, I will add, that I have now by me a Sugar, made of the Juice of Maple in *Canada*: 'twas given me by *M. de Villermont*, who is famous for his Curiosity in natural things. This Sugar is nothing but the Juice of Maple, condens'd by Evaporation, in the same manner as the Juices taken from Sugar-Canes are thicken'd, to make Powder-Sugar. This Juice of Maple is pleasant to drink, and an excellent Remedy for the Diseases of the Stomach and Liver. The plainer the Physick is, the more 'tis efficacious.

Van-Helmont declares himself for the Juice of Birch. 'Tis not his Fault that there is not made of it a *Panacea*, or universal Remedy for all the Diseases in the World. This Author is very remarkable when he speaks of his Juice of Birch. He pretends in the first place, that Birch in this Country, is what the *Nephritick-Wood* has been for Three Thousand Years in the *Indies*, that is to say, a Sovereign Remedy against the Stone, and all Nephritick Pains. Then he comes to the Juice of Birch, and says: I have observ'd, that 'tis a common Practice with the Princes of *Germany* to drink every day, during the Month of May, a Glass of the Juice of Birch, as a Specifick against the Stone. They keep this Juice in Bottles, with Oil of Olives on the Top of it, lest the Air should get in, and spoil this excellent Liquor, this perfect Balm, which is ineffimable. This Juice refreshes the Entrails, cures the Heat of the Liver, is Sovereignly good against

the Gravel, the Pains in the Reins, and the Cholick. It gives ease immediately, and heals afterwards. *Van Helmont* goes so far as even to ascribe to it the Virtue of reconciling Man and Wife, whom Witchcraft and Inchantments have set at Odds. *Observavi, Principibus Germaniæ fuisse vernaculum, quod contra Lithiasin quotannis in Maio biberent quotidie haustum Lique- ris ecortice vulnerata Betulae. Redactus sum ergo agnoscere liquorem illum, sponte e Ramis Vulneratis fluentem tam abunde, esse merum Lithiasis Balsa- mum, &c. De Lithiasi, Cap. 8. Sect. 25. pag. 48.*

The Juices, or the Tears that trickle from the Vine, after pruning, are likewise of manifold Uses in Physick. The Learned *Sachs* celebrates their Virtues in his *Ampelographia, Lib. 2. Sect. 3. pag. 72.*

1. This Juice taken inwardly is a great Remedy against the Stone in the Kidneys, and in the Bladder.

2. This Juice condens'd, which grows about the Vine, like Gum, being dissolv'd in Wine, and drunk fasting, makes us void the little Stones and all manner of Gravel.

3. A Glass of these Tears restores to a Drunken Man, his Reason and his Senses, which the Liquor of *September* had perverted: Provided it be possible for a reasonable Man to drown his Reason in Wine.

4. To wash with this Liquor cures the Itch, the Leprosy, and all other Diseases in the Skin.

5. Some Drops of it dropt into the Ear, will cure Deafness.

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6. This Juice -clears and considerably strengthens the Sight, by putting some Drops of it into the Eyes every Morning and Evening.

7. Of this Juice is made the excellent Balm *αμυδαλαγμα* by exposing it a whole Year to the Sun. It thickens to the Consistency of Honey, and is then a precious Balm to cleanse and heal all sorts Wounds Ulcers.

Pliny tells us in a few lines the Use was made of it in his Days. The Tears of Vines are as a sort of Gum. They cure the Itch, the Leprosy, the Heats of the Liver; provided you Wash your self first with Water, in which some Nitre has been laid to melt. This same Juice mixt with Oil, will fetch off the Hair, if you rub your self often with it. *Lachryma vini-um, qui veluti Gummi est, lepras, & liebenas, & psoras nitro ante preparatas, sanat. Eadem cum oleo saepius pilis illitis, philothri effectum habet.* Hist. Nat. Lib. 3.

'Tis certain, and obvious too, that the Juices which come of themselves, are much more natural, and more efficacious, than the Juices and Extractions that are made according to the Rules of Pharmacy. The Artits too themselves confess, that they torment the Plants, and employ violent Means, as Contusion, Trituration, Fermentation, Combustion, Maceration, Putrefaction, Distillation, to compose their Extracts. Under these Operations, the Plants must needs lose much of their natural Substance, and of their salutary Virtues. For is it not evident that in these forc'd and violent Preparations we lose the most essential Part of the Vegetables? At least it cannot be deny'd, but that the tenuious and volatile Parts of all Plants,

Plants, will escape and fly away by those Dissipations that are inseparably annex'd to Incineration. From whence we ought to conclude that the Juices drawn from Trees by *Terebration*, or from Plants by *Punction*, are the most perfect that can any ways be obtain'd.

But this is not all the Benefit of this curious Operation: For the Moment we have got the most perfect and most natural Juices, we may consequently have Salts of a Virtue much more analogical with the Vertue of the Plants; which certainly cannot be expected in the Salts prepar'd by Calcination. The Salts, drawn from Ashes have long been accus'd of being too caustick, and of having too much Acrimony; because they are depriv'd of the other Essential Parts that compose the Plants, and which the violent Action of the Fire has destroy'd and consum'd. It cannot be pretended, but the Fire wastes and dissipates the Sulphureous and Mercurial Parts of the Plant. On the contrary, the three Principles, the Salt, the Sulphur, and the Mercury, are in the coagulated Juices; which therefore contain more of the Essence and of the Virtues of a Plant, than the Salt that is extracted by Incineration, follow'd by Evaporation; in which Operations, all that was volatile in the Plant must be mostly dissipated.

The learned of the Profession have argu'd in the same manner. The concrete, coagulated Juices, or the *Succulent Salt*, as *Laurembergius* so well calls it, has two advantages above the Salt, extracted by Incineration. 1. 'Tis sweeter, more temperate, less dry, and less corrosive. 2. It retains still the Sulphur, and the

the Mercury of the Plants; of which the Salt drawn from Ashes, cannot have the least Particle. *Sal succulentus, qui in Succis concrefcit, Præstantior eft Sale per calcinationem facto.* 1. *Quia Sal cineritius non retinet mercuriales & Sulphureas Qualitates.* 2. *Quia induit ab Igne magnam Acrimoniam & Calorem.* Arnold. Schroderus cont. Gunth. Billich. Quæft. 9. & 10. pag. 41.

For this we have the Authority too of the learned Chymist, M. *Humbert*, who declares, that in every Analysis, which he made of Plants, he found that those in which he employ'd a great Fire, were not so proper to discover the true Principles and Virtues of a Plant; because the Fire changes too much their natural Disposition, and their Degrees of Volatility and Fixation, and even *dissolves those Principles*; nor is it possible to prevent that Loss. *Memoires de l'Academ. des Scien.* 1701. pag. 116.

It would be therefore of great Moment to perfect what the Naturalists of *England* have so well begun: And by these Juices so naturally extracted, Mankind may be assur'd of Medicines, by whose Helps they may live as long, and as vigorous a Life, as the ancient Patriarchs.

The Juice of Ash is much recommended as a Sovereign Remedy against Poyson, and the Sting of Serpents. *Pliny* speaks of this Tree, as of a wonderful Vulnerary; and assures that in all Nature there is no Specifick for Healing of Wounds, and against Poyson, that can be compar'd to the Juice of Ash. He gives this Description of it, according to his own Experience. The Juice of Ash, says he, is a power-

powerful Remedy against the Biting of Serpents. To drink of it will perform the Cure. Apply some Leaves of this Tree to a Wound, and it will heal. I know not any Remedy so speedy and certain; and I believe there is nothing in the World so good and safe. The Ash is so powerful a Remedy against Serpents, that neither in the Evening, nor the Morning, when the Shade of that Tree stretches farthest, no Serpent whatever will dare to pass under it. And I know by my own Experience, that a Serpent, enclos'd with Ash-Leaves, and a Fire thoroughly kindled, will throw himself rather into the Flames, than cross over the Leaves. *Contra Serpentes vero Succo expresso ad Potum; & imposita Uteribus, opifera ac nihil aequè reperiuntur Fraxini Folia. Tantaque est vis, ut ne matutinas quidem, occidentesve Umbras, quam sunt longissimæ, Serpens arboris ejus attingat, adeo ipsum procul fugiat. Experti prodimus; si fronde eà gyro claudatur ignis, & Serpens; in ignem potius, quam in fraxinum fugere Serpentum. Hist. Nat. Lib. 16. cap. 13.*

Since the days of Pliny, several other Virtues have been discover'd in the Ash. There are so many wonderful things said of it now, that if but one half of them were true, we should find in this single Tree an intire Dispensatory; and the Leaves, the Wood, and the Juice of Ash, would be sufficient to furnish an Apothecary's Shop. Schottus has carefully collected the thirty seven Virtues, which the Germans ascribe to the several Parts of this Tree.

1. The Wood of Ash, carry'd about you, stops a Loosness, cures the Cholick, and the Fits of the Mother. It must touch the Skin.

2. It stops the bloody Flux, and all other Losses of Blood, if held in the Hand till it grow Warme.

3. It prevents a Wound from gangrening, and heals it speedily; by grating a little of the Wood in cold Water; and washing the Wound with it several times a day.

4. When any contagious Distemper reigns, drink a Spoonful of the Juice of Ash fasting, and you need not fear the spotted Fever, nor even the Plague.

5. They who fear they shall be poyson'd, need only drink in a Cup, made of the Wood of Ash, and the Poyson will lose it Strength and Malignity.

6. The Juice of Ash is a Sovereign Antidote against all Poysons whatever.

7. It clears and strengthens the Sight, washing the Eyes with it Morning and Evening.

8. Drink of it in the Morning, 'twill cure all nephritick Pains, fortify the Heart, and suppress and keep down the Vapours.

9. Put it warm into the Ears, and it cures the Hardness of Hearing, any Deafness, that is not inveterate, and the inward Diseases of the Ear.

10. Drink of it in the Morning, 'twill cure the Spleen, the Tisick, and Dropsy; malignant Fevers, the Small Pox, and the Plague.

11. In great Pains in the Head, take an equal Quantity of this Juice and of Wine, boyl them together, than dip a linnen Cloth in them, and apply it to your Forehead.

12. For young Cancers, dip a fine of Piece Linnen in this Juice luke-warm, and apply it to
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the Sore; 'twill stop the Progress of the Ill, and soften the Callosities.

There are thirty seven Articles of the like Nature, that contain the Virtues of this wondrous balsamick Juice; all which are related at large by *Schottus*, in his Book intitl'd, *Jo-co-seria Natur & Art. Cent. 3. Proposit. c. Sect. 3. p. 299.*

Moreover, These Juices may serve for Drink. The Juice of Sycamore is not only sweet and pleasant to the Taste, but likewise very wholesome. The Juice of Birch has nothing unpleasant: the use of it would be excellent for those who are afflicted with the Stone or Gravel. The Juice of the Walnut-tree is admirable, to sweeten the Blood and the Humours.

Tong says, that with the Juice of Sycamore they make incomparable Beer. Hear his own Words. With one Bushel of Malt and a little Measure of this Sweet Juice, we make Beer as good and as strong, as if there were four Bushels of Malt, with the ordinary Water; Nay, this Drink will be better than *March-Beer*, which is so much esteem'd. Then he adds. This Juice is extracted for a Month together, and to keep it well, in order to make Beer of it, you must set in the Sun in Glasse-Bottles, as fast as you get it, and not take it from thence till you have all the Quantity you desire. When you have Juice enough, put into it a Loaf of fine wheaten Bread, very thin and well bak'd, but not burnt, and when you see that your Juice ferments and puffs up, take out the Bread, and put the Liquor into Glasse-Bottles, stopping them very well with Cork; if

if you put two or three Cloves into each Bottle, the Juice will keep a whole Year, and you will find it a delicious and very wholesome Liquor. I have kept the Juice of Birch in this Manner, above a Year, and it had not the least ill Taste. *Philosoph. Transact. April, 1669. p. 52.* They who live in the Country may spend their Time usefully and pleasantly in these Occupations. The Philosophical Transactions of the Royal Society of *England* speak of several Persons, and even of a Lady, who is arriv'd to great Perfection in the Management of these sorts of Juices, knowing wonderfully well how to make them ferment, and how to preserve them a great while.

All I can add to this Philosophy is, that in *Normandy* they need only tap their Apple-Trees in the Month of *March*, to draw out the Cyder, which is not made till *September*. They would save themselves much Labour and Cost; the making of Cyder being Toilsom and expensive: but above all they would secure themselves against many Accidents. For it often happens, that after having seen with Joy, the Trees cover'd with Blossoms, the Frost of one unkindly Night ruins all, and destroys the flattering Hopes they had conceiv'd of filling their Vessels.

Perhaps too, besides this premature Crop, which they might thus lay hold of in the Spring, they would nevertheless have another, as usual in Autumn. The Sap, that rises up into the Trees in *March*, is always so abundant, that there wou'd still remain a sufficient Quantity to furnish Nourishment, and to bring to
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Perfection both the Blossoms and Fruits. At least, *Tong*, whom we cited last, believes so. 'Tis even possible, says he, that the Trees, whose Sap has been extracted, will thrive the better, and bear the more Fruit; as some Persons grow fat by frequent letting Blood. *Possibile est etiam, ut Arbores melius crescant, et plures producant fructus: quemadmodum quidam magis pinguescunt frequentioribus venæ Sectionibus.* Act. Philosoph. Februar. 1669.

Might not the same thing be done in regard to Vines? If the Sap, which they distil in the Spring, were well fermented, and prepar'd with some Cloves, Cinnamon, &c. 'twould be a Nectar to such as love to drink the Juice of the Vine, and to whom Water is hateful.

I have read some where in the Philosophical Transactions, that there are Trees, from which much Liquor cannot be drawn; of this Number are the Trees, who Sap is Gummy. These Observations are yet to make.

CHAP. VI.

The Multiplication of Corn, even to a hundred Stalks from one Root: and a Method of considerable improving thy Revenue of Estates in the Country.

THERE are some Questions, that are continually canvass'd in the World; nor is it yet known which side 'tis safest to take. 'Tis ask'd every Day, whether there be any such thing as Witches;

Witches, that is to say, Persons who have Communication with the Devil, and who work Miracles by his Assistance. The Learn'd, who have treated of Diabolical Madnefs, have related so many Fables on the Point of Witchcraft, that they have given cause to call all the Rest in Question. The Witches, who bestride a Broom, and ride out at the Chimney to their Nocturnal Meetings, where they see and worship the Devil, are Stories, of which many Men of Sense believe not one Word. The Ignorant on the other hand, impute to Sorcery all the Effects, whose Causes they cannot discover. And there are between both some Men of great Parts, who absolutely deny that there are any Witches, who converse with the Devil.

The Philosophers Stone, or the Secret of making Gold by Art, is likewise often the Subject of Conversations. Tho' it be likely that no Man yet ever had this Secret, and that it will never be found out; there are nevertheless always in the World many Projectors in Chymistry, who are perswaded that this Powder of Projection is not a Chimæra. However the World is at this Day a little undeceiv'd, concerning these pretended Gold-makers. Some of the Learn'd call them a credulous and lying Race: *animal credulum & mendax*. They are sometimes to be pity'd: For after they have broken their Brains even to Dulness, it happens, according to the Latin Proverb, that where they thought to have found immense Treasures, they find nothing but Coals: *Carbones pro Thesauro invenimus*. Phædr. lib. 5. Fabul. 6. This agrees with what a Modern Author says, that he who pretend to find
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out the Philosophers Stone, is an Animal, who professes an *Art without Rule*: who begins by *Lying*; who goes on by *tormenting himself*, and who ends in *Beggary*. *Ars sine Arte*; *cujus Principium mentiri, medium laborare; & finis mendicare.*

To speak freely; they who believe, that there is an Art to make Gold, ought to have an ill opinion of the Depositaries of so inestimable a secret: for there are Times and Circumstances, when methinks these Confidents of Nature ought to lend their helping Hand, and assist their Country with some of these Mountains of Gold, which they boast themselves able to produce, whenever they please.

I am of the same Opinion too as to the Secret of the Increase of Corn. I believe that too to be one of the Discoveries that ought not to be conceal'd, especially in some Conjunctions. For how many Souls perish in the general Want, and in a great Scarcity of Corn. He who would maintain that a man may keep a Secret to himself, that would fill all Places with Plenty and with Abundance, must first prove it lawful, to suffer a million of Souls to dye for Hunger when he might easily relieve their Wants. *Si non parvisti, occidisti*, says St. Bernard.

I therefore believe that a Christian ought not to make a Mystery of a Secret, which the Sense of Humanity only obliges him to make publick. The very Heathens of sound Reason would abhor a Concealment so prejudicial to the Society of Men. 'Tis easy to judge what Cicero wou'd have thought of it by what he has said on a Subject almost parallel to this.

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In his *Offices*, which may be call'd a Book that contains the purest Morals of Nature, *Cicero* proposes a Doubt, upon which two *Stoick* Philosophers were divided, and which he decides afterwards himself. The Case was this. During a great Famine in the Isle of *Rhodes* a Merchant arrives there with a Vessel of Corn, that he had taken in at *Alexandria*. He knows several other Ships were freighted there with the same Merchandise at the same time, and that they would arrive at *Rhodes* soon after him. Ought he to tell it? Or may he keep it secret, to get the better Market for his own Corn? Upon this Question, two *Stoick* Philosophers are of different Opinions. *Diogenes* believes that the Merchant is oblig'd to no more than what the Civil Law directs, which is, to declare if his Merchandise have any Fault or ill Quality in it, and to sell it without Fraud: but that as for the rest, his Business being to sell, 'tis lawful for him to make his Advantage of the Conjunction, and sell his Corn as Dear as he can. I have brought my Goods hither, says the Merchant, with great Difficulty and Hazard: I expose it to Sale; I sell it not dearer than others; and perhaps for less than it would be sold for in a Time when there might be greater Plenty of Corn. Whom then do I injure?

What, says *Antipater*, are not you to promote the publick Good, and to serve the Society of Mankind? Were you not born for that End? Do not the Principles of Nature, that are in you, and that you ought to obey, tell you, that *as your Profit is the Profit of the whole World, so the Profit of the whole World is yours likewise*? How then can you conceal from the *Rhodians* the Good

Fortune, that is coming to them? A Man has a House that he would dispose of, because it has many Faults, that no Man knows of but himself? 'Tis infected, but taken to be healthy: Serpents come into all the Rooms: 'Tis built of Ill Materials, and ready to fall; and no Man knows any of these things but the Owner of the House; who sells it without giving Notice of these Defects to the Purchaser, and for a greater Price than he hop'd to sell it for: Is not this an ill Action? No Question of it, continues *Antipater*: For is it not the same thing as *not to set right a Man who has lost his Way*: Which the *Athenians* thought worthy of publick Execrations? Nay, 'tis much worse: for 'tis suffering the Buyer to fall into a Precipice, which he did not see, and which is perfidiously conceal'd from him: And wilfully to lead a Man into an Errour, is without Comparison a greater Crime, than not to shew the Way to one that has lost it. But let us hear *Diogenes* plead for the Seller. Did he who sold you this House, force you to buy it? Did he so much as solicit you to do so? He got rid of it, because it did not please him; and you bought it, because it did please you. We see every day that a Man, who has a mind to dispose of his Country House, puts into the publick Advertisements; *A good well-built Country House to be Sold*. And tho' the House be neither good nor well-built, they are not call'd Cheats for so doing. How much less then ought he to be so, who said neither Good nor Bad of his House. When what we sell is expos'd to the Eyes of the Buyer, to look on it as long as he pleases, where is the Fraud

in the Seller? A Man shall be held to what he said; but not to what he never said. Was it ever yet heard that a Seller is oblig'd to discover the Defects of his Goods, and would any thing be more ridiculous than to Publish in an Advertisement: *A House, infected with the Plague, to be sold.* 'Tis time, concludes Cicero, to determin these Questions: For I propos'd them with Design to resolve them, and not to leave them undecided. I say then, that the Corn-Merchant ought not to conceal from the People of *Rhodes* what he knows of the other Vessels, that are coming after his: Nor this Seller the Defects of his House from him that was buying it. I know very well that not to say all I know, is not always to conceal it. But 'tis to conceal it, if it be for their Interest, with whom we are treating, to know it; and for ours to keep it hid from them. Thus you see what it is to conceal things in like Circumstances, and what sort of Persons are capable of it. They are not certainly plain-dealing, upright, undesigning, ingenuous, honest Men, in a Word, Men of Honour: But double-hearted, dissembling, trickish, Malicious, ill Men. *Non igitur videtur nec Frumentarius ille Rhodius, nec hic adium Venditer celare Emptores debuisse. Neque enim id est celare, quicquid reticeas Sed cum quod tu scias id ignorare emolumenti tui causa velis eos, quorum interfit id scire. Hoc autem celandi genus quale sit, & cujus Hominis quis non videat? Certe non aperti, non Simplicis, non ingenui, non viri boni: Versuti potius, obscuri, Astuti, Malitiosi, Callidi, vateratoris, vafri.* Lib. 3. Offic. Certainly this Decision is most Just and equitable, It ought to confound those Extortioners and

insatiate Usurers, who wish there were no Corn in the World, but that which they conceal in their own Granaries; and who take more Delight in being the Murderers, than the Fathers of the Poor; and are always ready to build their own Fortunes on the Destruction of others. We have seen the Character Cicero gives of them: But St. Chrysostom goes farther: for after having excluded them from the Society of Men, he places them among the Savage and cruel Beasts; nay, even among the Devils. What can be worse, says that Saint, than a rich Man, who wishes for a Famine, that he may sell his Corn the Dearer. He is not a Man; he's a Wild-Beast; he's a Devil. *Vidisti quomodo autem non finit Homines esse Homines, sed feras, & Diemones. Quid enim hoc divite fuerit miserabilius, qui optat quotidie esse famem, ut ei sit aurum. Homil. 39. in 1. Epist. ad Corinth.* And all this agrees perfectly with these Words of the Scripture. *He who hides his Corn, shall be curs'd by the People, Qui abscondit frumenta, maledicetur in Populis. Proverb. cap. 11. v. 26.*

If a Man conceal'd the Secret of the Multiplication of Corn, he would deserve all the Execrations, with which the Scripture, the Fathers of the Church, and even the Pagans load those that hide their Corn. A just and good Man ought to wish that Plenty reign'd in all Places; and should do all he can to procure it to do so. 'Tis a pleasure to do good even to our Enemies.

I will here give the Publick all the Discoveries I have made concerning this so important a Multiplication. Of all the Methods propos'd

propose, there is not one that is not good: Some of them indeed I esteem and prefer before the rest, and which they are, will easily be seen by the Manner of my relating them, by the Care I take to recommend them, and by my justifying them from any Objections that might be made against them. I would not omit any, because such Persons as have any Knowledge in these Matters, may chuse the Method that is most proper for their own Lands; and perhaps of several that are indifferently good, they may make one that is excellent. These several Ways of multiplying of Corn are of the Number of such Things, as may daily be brought to greater and greater Perfection.

I. MULTIPLICATION.

TAKE a Bushel of Corn, and put it in a large Copper Cauldron; pour upon it five Pails of Water. Let it boil over the Fire till the Corn be burst, and the Water impregnated with the Essential Salt of the Seed. Strain this Water thro' a Linnen Cloth, and that nothing may be lost, give the Corn to the Poultry. Put into a great Kettle three Pounds of Salt Peter, or of Nitre, which is the same thing: pour upon it the Water in which the Corn was boil'd; four Pail-fulls of the Filth that soaks from a Dunghill. Boil all this together. The Salt-Peter will melt.

Having done this, take a large Tub, and put in it the Quantity of Wheat, Rye, Barley, &c. that you intend to sow: pour in your Liquor, which should be lukewarm, and cover the Corn about four Inches above it; because it

will soon swell. Cover it Close, that it may retain the Heat the longer, and put the Salts in Motion. Leave your Corn thus four and twenty Hours, that it may imbibe these fructifying Salts, which will not fail to open, dilate, and unfold the numberless Sprouts that are contain'd in each seed. For that is the main thing to be done in order to the Multiplication of any Plant, that is rais'd from Seed.

Take out the Corn, let it dry a little in the Shade, and then sow it very thin, because a third part less than usual will sufficiently feed the Ground. Put a little Straw, cut very small among it, that you may Sow it by Handfuls, without mistaking. They who live near the Sea will do well to add to it one third of Sea Sand, which will make the Increase much greater.

The Water that remains will serve for the same Use; for 'tis good to the very last. When the Sap begins to mount, a Pint of this Water at the Foot of each young Tree, will make it do wonders. Allow but as much to a Vine, 'twill repay you a hundred Fold in Fruits the next Vintage. This Experiment will be greatly improv'd by the Skillful. Some to whom I gave it to peruse; before they had read it, promis'd themselves Cabbages of a monstrous Size. 'Tis easy to divine all I could further say of it; I will not therefore particularly enumerate all the Pot-Herbs, which by this Secret may be made, stronger, fairer, more delicious to the Taste, and more wholesome. The Florists too will not be idle; and 'twill be their Fault if they work not Wonders.

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But this is not all. The Virtue of Nitre is not confin'd to the Race of Vegetables: But of this in another Place. They who keep Poultry and Cattle guess my meaning well enough already.

II. MULTIPLICATION.

THE whole Secret of Multiplication consists in the right Use of Salts. *Salt*, says *Palissy*, is the principal Substance and Virtue of *Dung*. A Field might be sown every year; if we restor'd to it by Stercoration, what we take from it in the Harvest; and there is no doubt but we might draw from our Ground an immense Profit, provided we assisted Nature by Art. So that if we can but find out the Means to impart to it an abundant Matter, proper for Germination and for Vegetation, we may be sure to reap a proportionably plenteous Crop. But this cannot be accomplish'd without Care and Trouble; and I address the following way of Multiplication, to such as are capable of so rustical an Occupation. This inestimable Treasure is only for the laborious, and for such as will takes pains.

Seeing all Multiplication depends on Salts, the main Business is to get together a great Quantity at little Expence, that the Profit may be the greater. The manner of which is thus.

- I. Provide three very large Casks, and stave out the Heads of them: Put in them almost whatever comes in your way; as, Bones of all sorts of Animals, Feathers, Skins, Shreds of Leather, old Gloves, Shooes, Horns, Hoofs of Horses and other Beasts; in a Word, all things that

that abound in Salt. Break the Bones, and cut all the rest in Pieces. In the first Cask, put whatever will soonest infuse, that is to say, the softest things: in the second the Matters that are not so soft: and in the third the Hardest Substances. Then fill all three of them with rain-Water, if you can get it. River-water is good: The Water of Pools, Ponds, &c. comes in the next Degrees. Let what is in the first Cask infuse four days; six, what is in the second, and eight, what is in the third.

After this Time of Infusion, separate the Water from the Substances, which you may throw away: but carefully preserve the Water. Amber-grease has a more Supportable Odour; than these infus'd Substances: but their smell is not more disagreeable, than that of the *Occidental-Civet*, upon which our Chymists sometimes work. In short, I speak to men who are desirous to enrich themselves: and upon that Score, I presume them to be of the Emperor *Vespasian's* Opinion, who made nothing of handling the Silver, which he got by the Tax he had laid upon Houses of Office. *Luci bonus odor ex quocunque fiat.* There are some little Inconveniences in Agriculture and Gardening that can not be avoided, and therefore must be endur'd. The Salts that the Earth loses in Vegetation, cannot be repair'd without Trouble. *De La Quintinie*, after an Experience of thirty Years says very well: There is for certain in the Bowels of the Earth, a Salt that causes its Fertility; and this Salt is its only and true Treasure. What it loses of this Salt, by the Production of Plants, must be made good. For properly speaking, 'tis on-ly

ly its Salt that diminishes. This earth therefore must be mended, and brought again to the same Condition. What it has produc'd by the way of Vegetation, may serve to mend it, returning to it by the way of Corruption. Thus all the sorts of *Stuffs and of Linnen, Flesh, Skins, Bones, the Hoofs of Horses, Dirt, Urine, Excrements, the Wood of Trees, their Fruits, their Moss, their Leaves, Ashes, Straw, all sorts of Seeds, &c.* all these things, returning into the Earth, serve to meliorate and improve it. Hereby, says he in another Place, the Earth, to use the Term of Philosophers, becomes *impregnated with nitrous Salt, which is the Salt of Fruitfulness.* Treatise of Agriculture Part. 2. chap. 22. Let it not then be wonder'd at that we oblige men to gather up such absurd and trivial things; seeing *de la Quintinie* himself likewise recommends them for the Advancement of Vegetation.

Moreover, all the Plants that grow along the Woods, in the Plains, on the Mountains, in Valleys and in Gardens, ought to be gather'd, together with their Flowers and their Seeds. These we burn to Ashes, from which we extract the Salts, by the Evaporation of the Humidity. The Bark of Oaks, being full of Salt, is also very good; and so is Rosomary, Lavender, Sage, Batory, Mint, St. Johns-wort, Sun-Flowers, &c. In the Evaporation, the Salts get together by Crystallization, and 'tis easy to pick them out. They must be dry'd to preserve them.

Take as many Pounds of Salt-Peter, or Nitre, as you have Acres of Land to Sow. For each Acre, dissolve a Pound of Salt-Peter in twelve Pints of the Water that Sinks from the

the Dunghil. When the Salt-Peter is quite melted, throw in a little of those Salts of Plants, according to the Quantity you have of them. This Liquor is then call'd the *universal Matter*; because Nitre is truly the universal Sipirit of the Elementary World; as we shall see hereafter.

This is the main Point of the whole Secret of Multiplication. We will for the future call the Water that is got ready in the Casks, *Prepar'd Water*; and the Water in which are the Salts extracted from Plants, and the Nitre, *Universal Matter*.

USE.

GET ready your Corn, or other Seed, for two Acres at a time, or what you can get Sown in one day or two.

For one Acre take twelve Pints of the *prepar'd Water*, and mix with it immediately the *universal Matter*, in which there ought to be a Pound of dissolv'd Nitre. The Vessel into which you put these Liquors must be large enough to contain the Corn, which you design for one Acre. Then strow in your Corn, into these Liquors. Let it fall in gently, that you may take off with a Skimmer, the Corn that swims on the Water; which is not fit to Sow. *Semina, quæ in aqua subsident, firmitiora sunt, & adserendum fideliora: quæ fluitant, languidiora, & Propagationi inepta*, says Ray, *Hist. Plant*, lib. 1 Cap. 18. p. 34. There must be two Inches of Water above the Seed: And if you have not enough, fill it up with

the best common Water you can get: That of the Horse-pond, is the most Proper.

Leave the Corn to soak for twelve Hours, and stir it up and down every two: If by that time the Seed do not swell, let it lye longer, till it begin to plump up considerably. Then rake it out, and put it in a Sack to drain. Leave it there some Hours, that it may ferment and grow Warm. Take care not to lose the Water that drains away, it being good to the last Drop for all sorts of Seeds and Corn.

Sow this Corn, while 'tis yet a little Moist. One Third less then usual will serve for an Acre: Nay, you may safely use but half as much, and mingle among it some straw cut very small; that the Sower may rake it up by Handfulls, and sow it the ordinary way, as I have said already.

OBSERVATIONS.

1. Choose the fairest, cleanest, plumpest and heaviest Corn you can.

2. Fat and heavy Grounds ought to be plough'd early; before the Rains begin, which render the Earth yet more heavy. We Sow this sort of Soil, as soon as 'tis plough'd; that the seed, by the Magnetick Virtue, with which it is impregnated, may attract the universal Spirit that is diffus'd in the Air. We ought, if we can, to be beforehand with the great Rains; that when they fall, the Marriage of Heaven and Earth, may be already consummated, by the Germination and by the Vegetation of our Corn, that is deposited in the Womb of the Universal Mother of all Vegetable

getable Productions. All Seeds should be sown in dry Weather, says Ray. *Semina omnia sicca tempestate serenda sunt: tertio, quartove die a pluvia largiore.* Three or four Days after a great Rain. *Hist. Plant. lib. 1. cap. 18. p. 34.*

Quintinie makes the same Remark, nor can we have too much Regard to it: for according to this we ought to govern our selves, to know what Method 'tis best to chuse, to improve our Lands. The same Matter is not good alike in all Places. And they who observe not these Distinctions, are in danger of finding ill Success, and will wrongfully blame the Secrets we impart to them. There are, says that eminent Gardener, two general Defects in Soils. The first is, to be too moist, which is common accompany'd with too much cold and heaviness: The second is to be too dry; and such Soils are over-light, and very apt to be scorch'd and parch'd up. Two different Remedies must be apply'd to these opposite Inconveniencies. We see likewise that of the Dungs we imploy, some are fat and refreshing, as Cow-Dung, and that of Oxen: others are hot and light, as of Sheep and Pigeons. Now seeing the Remedy ought to be suited to the Disease, hot and light Dungs ought to be us'd in moist, cold, and heavy Earths, to render them more light and friable. In like manner the Dung of Oxen and Cows is most proper for lean, dry, and light Soils, to make them more fat and substantial; and thereby to hinder the drying Winds of the Spring, and the extream Heats of Summer from parching them up too easily. *pag. 218.* This no doubt is arguing aright in the

the Affairs of Agriculture and Gardening; which by such Observations only can be brought to Perfection.

Lean and light Earths ought not to be sown so soon; at least unless they ly in watry and marshy Bottoms: for in that Case they must be treated like heavy Earths.

Moreover; 'tis a fault to bury the Seed too deep; for then 'tis depress'd and kept under by the Weight of the Earth that covers it, and cannot so well participate of the nitrous Vapours and Exhalations, that float to and fro in the Atmosphere of the Air. Ray advises to take great Care not to sow the Seed too deep in the Ground; seeing that would be to bury it there, past all hope of Resurrection. *Summopere cavendum ne semina alte demergantur, aut nimia terra obruantur; adeoque sine ulla resurrectionis spe sepeliantur.* Hist. Plant. lib. 1. cap. 18. pag. 34.

3. If the Earth be subject to Weeds, it must of necessity be plough'd twice or thrice, to take away all the Roots of them.

The Year following it need be plough'd but once; yet Deep, and the Ridges near one another.

4. 'Tis not requisite to dung the Ground: but if you have any Dung to spare, make use of it. The Crop may be the better.

Whoever has no mind to practice this Method in all its Circumstances, may omit the Infusion which I directed to be made in the three Casks; and mixing some Water with Stable-Dung, and with that of Pigeons and Poultry; strain it, and put some Nitre to melt in it.

But

But the Success of this Preparation will not be comparable to the Success of the former.

III. MULTIPLICATION.

SOME Husbandmen lay together in a Ditch a Quantity of Horse-Dung, and often throw water upon it: when it has lain rotting for some time, they drain away the Water, that is impregnated with the Salt of the Dung. Then they boil it a little in a Copper Vessel; put in it a little Nitre; and when it has been off the Fire so long as to be but luke-warm, they steep in it the Corn they intend to sow; and let it macerate in that Liquor for the space of three Days, that it may swell, and that the first Sprouts may open, dilate and unfold themselves: after this they take it out of the Water to dry it a little, and then sow it.

And because an Acre will require a third part less than usual, they chop some Straw very small, and put a Third among the Corn they have prepar'd as above. This Method succeeds very well, and some Farmers have had very plentiful Crops by making use of it.

IV. MULTIPLICATION.

THere are other Husbandmen, who never prepare their Corn, but employ their whole Care on the Manuring of the Earth; which they do in this manner. In the beginning of *June* they get together as many Weeds as they can meet with any where near them: these they dry in the Sun, and then burn them to Ashes; which they afterwards
mix

mix with Sea sand, and strew it on their Lands a few Days before they sow their Corn. 'Tis certain this is a very good Method. The Salt of the Ashes of the Plants and the Sea-sand impart to the Earth a wonderful Fruitfulness.

V. MULTIPLICATION.

CAmden, in his Description of *Cornwall*, says, that the Husbandmen of that County, make use of Sea-weed, and Mud, to fertilize their Land that is naturally very barren. He adds, that by this means, they have a greater Increase, than can be imagin'd.

VI. MULTIPLICATION.

CHildery in his Natural History of *England* relates, that the Inhabitants of *Cornwall* have found by Experience, that nothing so much contributes to the Fruitfulness of their Ground, as Sea-sand; and that the farther in the Sea this Sand is taken up, the Richer is the Harvest. These four last Observations for the multiplying of Corn, are taken from the 112th Observation of the Journals, *Curiosorum Naturæ, of Germany*, 1671. pag. 185. &c.

In the same Observation, mention is made of an Ear of Barley of a prodigious size. 'Twas compos'd of fifteen large Ears, and of nine lesser: but all of them extreamly full of Grain. It grew in *Silesia*, and was carry'd to *Vienna* to be presented to the Emperor as a wondrous Curiosity. Some Naturalists were of Opinion, that this Plant sprung from several Grains of Barley, that had been by Chance

dropt in the same Place. Thus *Ferrari* says, that if several Seeds of the same Kind, but of different Colours, were mixt together, and put into a Cane, or into a Branch of Elder, to be laid into the Ground, the Buds would mingle and confound themselves together, and that a Plant would Spring from them, that would bear Beautiful Flowers, variegated like the Rainbow: That *Iris*, says he, would be form'd not by the Tears of a Cloud, that dissolves itself in Rain, but from the Smiles of Joyful Nature; *Ut Semina invicem mixta & confusa Floræ quoddam buxuriantis monstrum, & Iridem non ex lachrymis resolutæ Nubis, sed ex risu gaudentis Naturæ exhibeant.* This Explication is very fine and artful in the highest Degree; but perhaps not so true as it should be. And if the Naturalists of *Germany* had call'd to mind what we see every Day, that when a Grain of Corn, or a Seed of Hemp falls in a Garden, where it finds plenty of Nourishment; it forms a Plant of a wonderful size. They needed not, on occasion of this great Ear of Barley, to have had Recourse to this Plurality of Seeds fallen in the same Hole; nor to suppose that the Buds pierc'd through one another, to form but one plant of them all: which Opinion contains several weighty Difficulties. I will not absolutely deny what *Ferrari* says: It may perhaps be that the several Seeds which touch one another, coming to dilate themselves, and the Buds to unfold, the Principles of Life, contain'd in each Seed, will mix and confound themselves, and produce an agreeable and diversify'd Mixture of Colours in the Flowers that Spring from them. But

I cannot think that of a Composition of several Buds, there can be made but one.

These German Naturalists add one thing more concerning the Matter we are now upon, that deserves our serious Attention. 'Tis certain, say they, that the Industry of Husbandmen might always imitate and do by Art, what Nature sometimes does of her self. They might compel her to give us each Ear of Barley as big as that which grew in *Silesia*. We need only examin narrowly into the Steps of Nature, and trace her in View, when she diverts herself in giving such uncommon Productions: 'Twould be in vain for her to conceal herself, with due care and vigilance we should find her out, and when we have discover'd what could put her once in so good a humour; we need only treat her in the same manner, to make her act over again the same scene: then all our Toils would be amply rewarded: we should certainly, as often as we please, oblige her to give us these uncommon Productions; and such Harvests as would diffuse Chearfulness and Plenty in all Places.

VII. MULTIPLICATION.

WE ought not to Slight any thing that has been left us by Eminent Men, especially by such as apply'd themselves to cultivate the Arts that are useful to Life. And tho' Ray has spoken only of the Manner of sowing Garden Seeds, yet what he says of it deserves to be mention'd here: tho' even our Design were not to give new Instructions for Gardening, as well as for Agriculture.

Some, says he, before they sow their Seeds, lay them a soaking in Water, in which they have dissolv'd some Nitre, or else in Wine, to hasten their Germination: which I take to be useless in new Seeds; but I disapprove not of the Method of *Corvinus*, in regard to exotick Seeds, or to such as have lain long. *Ferrari* says, that in relation to Seeds that are grown hard, and consequently are slow to germinate, *Corvinus*, before he sows them, lays them twelve hours in Water, with a little Nitre in it. Sometimes he leaves them there to macerate longer, according to the apparent hardness of the Seeds; and waters them afterwards with the same Water, to the End that the Nitre, being mingled with the warm Exhalations of the Earth may excite the Buds to open and unfold themselves in order to a quick and happy Germination. *Ut Nitrum ex igneo terræ habitu concretum seminalem contumaciam ad uberem germinationem provocet.* *Ferrari FLORA, sive florum cultura, lib. 3. cap. 1. Lex floris serendi, pag. 211.*

VIII. MULTIPLICATION.

TAKE the Dung of Cows, Horses, Sheep, and Pigeons; of each the same Quantity: Put the whole together in a Vessel of Wood or Copper; no matter whether: Upon it pour Water boiling hot: Leave it so for some Days, and then pour out the Water from the Ordure into another Vessel, into which put as many Pounds of Nitre, as you intend to sow Acres of Land. When the Nitre is melted, put in your Wheat or other Corn, and let

let it soak in it four and twenty Hours. Then take out the Corn, and sow it a little wet, if it be a dry Season: but if the Weather be wet, spread it upon Sheets in your Granary, to let it dry a little before you sow it. Two Thirds of what is usually sown on each Acre will be enough. Once Ploughing the Land without Dunging it will likewise be sufficient: and tho' the Soil be ever so lean and barren, you may depend on having a good Crop, which will be ripe some Weeks sooner than the usual times of Harvest.

OBJECTION.

WE cannot believe that the small Quantity of Salts, that each Grain of Corn imbibes, can suffice to nourish so many Stalks and Ears, as by this Secret we are promis'd we shall have from one Root.

ANSWER.

THe Salts, with which each Grain of Corn is impregnated, are not precisely destin'd for the Nourishment of all this numerous Race. Their first Action is to cut the Covers that infold and wrap up the several Sprouts, that are contain'd in each Grain, to the End they may dilate and unfold themselves.

The Second Action of these Salts is to serve each Grain of Corn, as it were instead of a Loadstone, to attract the Nitre of the Earth, which the Subterranean Fires have reduc'd and driven into Steams and Vapours in the low and middle Region of the Air, for the

Nourishment of Vegetables and of Animals. This is not a vain Imagination, a Chimæra, or empty Notion. We know by uncontradictable Experiments, that Nitre, expos'd to the Air, attracts like a Loadstone, both Nitre and Humidity.

I. EXPERIMENT.

Concerning the magnetick Virtue of Nitre.

IF we calcine a certain stony Matter, which we find in old Leaden Pipes of Fountains, and draw the Salt from it: That Salt, being put into a Vessel, and expos'd to the Air, will continually attract Water, which, when filtered and evaporated, yields an excellent Salt-Peter. This Salt will not dissolve in moisture; but remains in the Vessel, when, by Inclination we pour off the Water which it has attracted; or else it stays behind in the Felt. *Moncoy's, Voyage Tom. 1. pag. 19.* This is the Action of the Nitre that fastens itself to the Grain of Corn: it continually draws to it the Humidity and nitrous Vapours, that float in the Air, and with which the Plants nourish themselves.

II. EXPERIMENT.

THE Learned of Germany confirm this magnetick Quality by another Experiment, that leaves no Room to doubt, but that Nitre attracts Nitre. If in a Summer's Night you expose calcin'd Pebbles to the Air, that Matter, which has some Nitre in it, will attract to it the saline Moisture of the Air: for

'tis certain, that the Atmosphere of Air, which surrounds the Globe of the Earth, is full of nitrous Corpuscles, which rise from the Earth and the Sea. *Continet enim Atmosphæra aeris exhalationes varias, quæ terra, quæ mari ascendentes, intra quas nitrosæ prævalent.* Observat. 18, Curiosorum naturæ, 1675. & 1676 pag. 28.

Now this Nitre is truly a Salt of Fecundity. Nothing in Nature is more precious though it be so little known, except to some Philosophers. 'Tis undeniably the *Balm of Life*, that maintains the whole Harmony of Nature in the three different Races of Minerals, Vegetables, and Animals; and without which all mixt Bodies, would resolve into their first Principles; and out of their Ruins form the primitive Chaos. 'Tis this inestimable Salt that holds all the Bodies of the elementary World in a State of Consistency.

Our Learned Men in *France* agree in this with all the Learned of *Europe*. *Hornberg* made an Experiment, that shows what Share Nitre has in the Vegetation of Plants. He sow'd in a Box some Fennel, which he water'd with Water, in which he had dissolv'd some Salt-Peter, and he sow'd Cresses in another Box, and water'd it with common Water. The Fennel, tho' sown in like Quantity, produc'd two Ounces and a Half of Plants more than the Cresses. Upon which he adds; Hence we may judge, that if Salts are not absolutely necessary to the Germination of Plants, yet they assist their Growth and their strength, since a greater Quantity was produc'd in the Earth water'd with Nitre. *Membir. de l'Academ. R. des sciences, 1692.*

III. EXPERIMENT.

Nitre melted in Water, diffuses and mixes it self with the Water, which becomes all penetrated with it. There is nothing easier than to withdraw this Nitre, from all the Pores of the Water, into which it has work'd it self. We need only Evaporate the humidity a little over the Fire, till there appear a little Pellicle on the Water; and then set it to cool. The Nitre will gather together in long, white, clear, transparent, beautiful Chrystal: So true is it that Nitre naturally assembles and conjoins its Parts: And thus the Nitre that floats in the Air, reunites it self to the Nitre, with which we impregnate the Corn, before we sow it. *Palissy* expresses this wonderfully well. Oil, says he, thrown into Water, reassembles; and separates it self from the Water. Can we desire a clearer Proof than of common Salt, of Vitriol, and indeed of all Salts, which, being dissolv'd in Water, so intirely separate themselves by Cristalization, and make each of them a body apart? *Des Metaux, & Alchymie*, pag. 1660. This I take to be Demonstration, and we ought no longer to doubt of so evident and constant a Truth.

IX. MULTIPLICATION.

Take ten Bushels of good Wheat; and calcine it, till you have reduc'd it to Ashes of a greyish Colour. Extract the Salt from these Ashes; which is done by making a Lixivium of them after the usual manner. Instead of Water, if you have any *May-Dew*, or *September-Dew*

Dew, the Operation would be incomparable better. *Solve & coagula.* Dissolve the Salts of the Ashes in Rain-water, if you have no Dew: and when the Water is impregnated with the Salts, of which the Ashes are full, you must filter it, and then coagulate. The Coagulation is perform'd by evaporating the Humidity. After this you find the Salts, which you ought carefully to preserve.

Then take of all sorts of Dung; [the Dung of Horses, Poultry, Pigeons and Sheep is best] and put them into a great Copper-Vessel: into which pour one or two Pints of Brandy, as much Dew as you can get, with several Pints of white Wine. If there be not Liquor enough, add some Rain-Water. Then leave it over a gentle Fire for four and twenty Hours, and keep stirring it often. Filter the Liquor which you preserve for the following Use.

U S E.

TAKE as much of this Liquor as will soak Corn enough to sow an Acre of Land. Put into it an Ounce of Salt of Wheat, and a Pound of Nitre. When the Salts are quite dissolv'd, spread the Corn upon a Sheet, and water it Morning and Evening for nine Days successively with this Liquor. The tenth Day sow it, one third thinner than usual. The Success will pay the Trouble, and make large Amends for the Cost.

Be not surpriz'd to see Wine made use of as one of the Ingredients of this Receipt: for Wine is a great Help to Vegetation; because it contains abundance of Salt. 'Tis not a late

late Discovery that Plants love to drink Wine; and that this Juice makes them thrive. *Cononberius* says, that if you humect the Roots of a Plane-tree, with a little Wine, tho' it appear'd almost quite dead, it will revive and shoot forth Branches of an extraordinary Length. *Pliny* observ'd this above fifteen hundred Years ago. We are not ignorant, says he, that Trees are very greedy of Wine. *Docuimus etiam Arbores vinum potare.* Hist. Nat. lib. 12. cap. 1.

X. MULTIPLICATION.

Virgil teaches us what the Husbandmen in his times did, that they might have a more plentiful Crop. I have seen several Husbandmen, says he, who laid their Seeds to steep in Lees of Oil, that had some Nitre in it, that the Ears might be larger and more Fruitful. *Geog. lib. 1.*

*Semina vidi equidem multos medicare serentes,
Et Nitro prius, & nigra perfundere Amurca;
Grandior ut fœtus siliquis fallacesbus esset.*

Columella, who liv'd soon after *Virgil*, explains *Amurca*, as I have done, not of Marc of Olives after they are press'd; but of the Lees of Oil; seeing we cannot lay Corn to soak, to macerate, and to soften in the first of these things. The ancient Husbandmen, says *Columella*, and even in *Virgil's* Days, never sow'd their Corn, till after they had laid it to soak in the Lees of Oil, and in Nitre. *Priscis autem rusticis, nec minus Virgilio, prius amurca, vel nitro macerari eam, & ita feri placuit.* *de Rustic. lib. 2.*

Pliny

Pliny applies to Beans, what Virgil said in general of all Seeds. Virgil, says he, advises to soak Beans in Nitre, and in the Lees of Oil, before we sow them, and promises from thence a plentiful Vegetation. Some believe the Increase will be the greater, if for three days before we put them into the Ground, we macerate them in Urine and in Water. Democritus directs to soak all manner of Seeds in the Juice of a Plant, call'd Aizoon, that grows on the Tops of Houses, and is call'd in Latin, *Sedum*, or *Digitellum*; which in all Appearance is House-Leek. Virgilius *nitro & amurca perfundi jubet fabam: sic eam grandescere promittit. Quidam vero, si triduo ante satum urina, & aqua maceretur; precipue adulescere putant.* Democritus, *succo herbae qui appellatur aizoon, in tegulis nascentis tabulisve, Latine Sedum aut Digitellum, medicata seri jubet omnia semina.* Hist. Nat. lib. 18. cap. 17. 'Twould require a great Quantity of the Juice of House-Leek to do what Democritus requires. This is an excellent Secret to keep Worms and Insects from eating the Corn in too mild a Winter: and Italy being a Country where those Animals abound, this Remedy may be of great use there. All these Observations are an Argument of the prodigious Diligence, that the greatest Men imploy'd to improve the Fertility of Plants,

The Use of Nitre for the Increase of Corn can not be too much recommended. Denis, so renown'd for his Learning thro' all Europe says, that 'tis a surprizing Secret for the Increase of Seeds, to steep them for some time before they are sown, in a certain Lye, made of Nitre; and that he had often found by ex-

perience

perience that all the Grains of Corn, that had been so prepared, shot out each of them above two hundred Stalks, and as many Ears, that were fill'd with a Multitude of Grains of the same Kind. *Conference sur les Scienc. pag. 166.*

XI. MULTIPLICATION.

Steep your Corn, or any other Seed, in Oil of Whale, for four and twenty Hours. After having taken it out, sprinkle it over with Linc, having first mix'd among it a little pulveriz'd Nitre. Then dry it, and sow it very thin.

From all that has been said 'tis easy to see, that the whole Secret of the Multiplication of Corn rould on Nitre, which has the greatest Effect on all Corn-Lands. All the Philosophers are unanimous as to that Article.

Bary, in his Physicks, says; in some Seeds, as in Hemp-Seed, there happens sometimes surprizing Multiplications: And if the *Fathers of the Christian Doctrine* at Paris, may be believ'd, one single Grain of Barley is capable to produce an incredible Number. *Sir Kenelm Digby*, who has furnish'd me with the Example of the Grain of Barley, whose prodigious Increase is kept at the Convent of the above-mention'd Priests, is of Opinion, that of all Soils, such as abound most with Salts are the most fertile, and that Rain-Water is more fruitful than common Water, because it gets in the Air a great Quantity of sweetish Salt, with which that Element always abounds.

Saint Romain, in his Book of natural Science, says, That Husbandmen dung their Ground,

and

and Denshire their Fields, that their Corn may be the better nourish'd, and that they may have the greater Quantity of it: but that if they knew the Way to steep their Seeds in an *acid Dissolvent*, or to water their Lands with it, there are none so barren, but they would become fertile: and that the Plenteous Crops they would bear, would glad the Hearts of the Husbandmen *Part. 4. Cap. 4.* But this Author forgets himself when he speaks of watering the Lands with the same Liquor in which we steep the Seed: in a due Preparation whereof consists the whole Secret of its Multiplication. And *Saint-Romain* would have enough to do, were he to water with his *Acid Dissolvent* all the Lands in *Picardy*.

'Tis pity Sir *Kenelm Digby* has been so reserv'd as to reveal to us but by halves the Secret of the Increase of Corn, for having himself made the Experiment, his Authority would alone be sufficient to convince us of the Truth of it. In his Treatise of the Vegetation of Plants he speaks to this Purpose: I find, says he, that 'twill not here be improper to tell you, why the Antient Poets kept such a Pother about their Goddess, who took her Birth from Salt: and how they conceal'd under the Veil of Salt, the greatest Secret of their natural Philosophy in:like manner as they always hid their deepest Wisdom under the Mask of Fable and Fiction. By the Means of Salt-Nitre, which I dissolv'd in Water, and mix'd with some other earthly Substance, which I took to be proper for my purpose, and that might in some Measure familiarize the Salt with the Whear, into which I design'd it should insinuate itself,

I have made a very barren and lean Field produce a very plentiful Crop, and surpass even the Land that of itself was very fruitful. Besides, I have seen a grain of Hemp-Seed, that had been water'd and humect'd with the same Liquor, produce in its due time so great a Number of Stalks, that one might have said in regard to the Thickness and Hardness of its Branches, that 'twas a little Forest of ten Years Growth at least.

The *Farmers of the Christian Doctrine* at Paris preserve to this day among them a Tuft of Barley, that contains two hundred and forty nine Stems or Branches, that Spring from one and the same Grain: in whose several Ears they count above eighteen thousand Barley-Corns. This indeed is very extraordinary, and they keep it accordingly as a very remarkable Curiosity.

Some, for the Increase of their Corn, make use of the Salt that they draw from the Famous Plant, call'd Heliotrope, Turn-Sole, or Sun-Flower; because the wonderful Flower of this Plant turns towards the Sun, and follows the Course of that Planet, even in a cloudy Day. *Planis Campy*, in his *obymical Hercules* speaks with Rapture of the Virtues of this Plant. He is always in an Extasy when he talks of his *Chrie*, which is the Name he gives the Heliotrope. He tells us one thing of it that is very observable, and relates to the Vegetation of Plants. He says, 'tis so loaded with Dew, even during the greatest Heat of the Sun, that we may in half an hour, get from one Flower, by shaking it gently several times, no less than two Ounces of Dew. But what say he not of the Virtues of this Dew? 'Twould be difficult



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A Plant of Barley growing from one Single Corn.

cult to guess: Let's therefore hear him himself Laugh not, *says he*, but try the Experiment, and you will find that Cankers, all sorts of Ulcers, all Venemous Bites and Stings, all Wounds, Heat of the Liver, Pains in the Stomach, Palpitation of the Heart, all Megrims and Pains in the Head, the Gout, the Leprosy, the Pox, the Plague, &c. all fly before it. It discovers Poyson, by breaking the Vessel that contains it, it frees from all Inchantments and Witchcraft, delivers Women in Labour; is admirable against all manner of Epilepsies, and drives out the Devils from Bodies that are possess'd. In short, so many are its Virtues, that were it not so common, neither Gold nor pretious Stones would be comparable to it; nay, *Arnold de Ville neuve* has ventur'd to say, that whoever takes a little of it every morning fasting, can scarce dye; and, indeed, it renews and restores intirely, each Fruit, each Herb and Trees likewise. *Qui potest capere capiat.*

To conclude, *Planis-Campy*, after having taught us the way to draw a solid Substance from this Dew, farther adds, *Put to nine parts of this Sulphur, one of Golden Sulphur of Antimony*, and he concludes only by an &c. For, *says he*, 'tis not reasonable to divulge the whole Secret to all the World. It leads directly to the Powder of Projection, to the Philosophers Stone. Thus you see, how *Planis-Campy*, stretching a good thing too far, fall into ridiculous Visions, and extravagantly assures, that this Matter restores to the Old new Youth and Vigour.

There is fallen into my Hands a Book, intitled, *The Earthly Paradise*; Written by a Monk
of

of *Avignon*, call'd *Gabriel de Cassagne*. There are some good things in it; but the Author is not much less out of the Way than *Planis Cam-py*, on the Subject of the *Heliotrope*. In the Year 1612, he profess'd Physick at *Paris*, whither the Mountebanks flock from all Parts: and he, like the rest, spoke of his Remedies with much Pertness, and little ceremony. There are no doubt some excellent Secrets in his Book; but what particularly concerns our present Subject, is the great value he sets upon the *Heliotrope*, which he calls *Turn-sole*. After having taken notice of its Sympathy with the Sun, he pretends, that there is no Disease, how incurable soever it be held to be, that will not submit to the Virtues of this Plant. His Receipt to use it is thus.

Take a *Turn-sole* intire, and full Ripe; pull its yellow Leaves in little Pieces, and together with its Seed, put it into a Bottle, cover it with good Brandy four Inches above the infus'd Matter, stop the Bottle well, and set it ten Days in the Sun, and keep it a-nights in a dry Place. Then pour off the Brandy, squeeze all the Dregs, and add the Liquor that comes out to the Brandy. After this calcine the solid Substance between two Ports well luted. Take the Salt from the Ashes, and dissolve it in the Liquor. A Spoonful of it taken fasting in half a Glass of white Wine, cures the *Noli me tangere*, all Shankers, the Stone and the Gravel. 'Tis a Sovereign Remedy against the Palsy, Dropsy, Agues, &c.

I. OBSERVATION.

IF by chance any of these Secrets should not succeed in some Places, it must not from thence be argu'd, that the Method is not good. I am of Opinion, that the best Secret cannot be good for all sorts of Soils: Try the Experiment at first in little, before you engage in too great an Expence. *Boyle* handles this Point admirably well. He has compos'd a Treatise on purpose, concerning the Experiments, that have succeeded once or twice, and never afterwards. A little Matter will change the Method of Nature, and make an Experiment fail. When we meet not the Success we expected, we should not disquiet our selves, and abandon the Attempt, as if it were rash, and not feasible; but carefully examine wherein we have not been exact, and whether we have proceeded as we ought. Thus argues *Boyle* in several Occasions, wherein both himself, and his Friends, were disappointed in their Hopes. He says excellent things on this Subject; but I will here touch only upon those that relate to the secret of Vegetation.

I remember, says *Boyle*, that the famous *Bacon*, and several Physiologers assure, that 'tis easy to have Roses so backward, as not to blow till towards the End of Autumn: They say, that we need only cut in the Spring, the tops of the little Branches, where the Buttons of the Roses begin to appear. Nevertheless several Persons have try'd this Experiment in vain, and after having found it fail, they concluded it to be one of those Chimera's, which the Natura-

lists impose on the Credulous. To speak the downright Truth of the Matter, I declare, says *Boyle*, that my Gardiner has assur'd me, that this Secret fails on most Rose-Bushes, and that by this Method we can have Roses in Autumn, only on such as are very strong and vigorous. We ought likewise to examine, on what sort of Rose-Bushes it may be effected. For 'tis certain that the Damask generally yield Roses in Autumn. Thus we ought not to ascribe to Art, what is meerly the effect of Nature. *Unde fieri potest, ut quod naturæ proprium est, falso arti attribuat, pag. 42.*

Indeed says *Quintinie*, When the Flowers begin to appear on the white Muscat Rose-Bushes, if there be any Shoots that have none, we ought to cut them off to within a Foot and an half of the Bottom; and at each Eye there will sprout forth a Shoot, which towards Autumn will bear many Roses. *Pag. 116. de la Culture des Fleurs.*

2. See here another Observation of the same *Boyle*, concerning Experiments that sometimes fail. Some Persons believe, that they ought not to give much Credit to what many Authors advance, that Fruits of different Kinds will grow on the same Tree. This they contest, because the Event has not always answer'd their Expectation. For my part, says *Boyle*, I believe it very possible, and have seen twenty three sorts of Grafts on the same Apple-tree, all of which produc'd according to their Kinds, three and twenty different sorts of Apples. This will succeed, even in regard to Trees of different kinds; and 'tis not long, says the same Author, since I had the Pleasure to gather Plumbs and Abricots from the same Trunk; from which

which we likewise hop'd to have had other sorts of Stone-Fruit. However, in point of Fruits that are heterogeneous, that is to say, of a different Nature, 'tis certainly difficult to make them come on the same Stock; so that we may well place among Events that are rare, doubtful and hazardous, the Experiments, which some nevertheless have successfully try'd, of having Fruits of different kinds, that had nourish'd themselves with the Sap of the same Tree. *Verum ut fructus admodum heterogenei unius stipitis succo feliciter nutriantur, res est tantæ difficultatis, ut experimentis contingentibus merito annumerandum sit.* pag. 42.

3. Another doubtful Experiment. The Reason is not generally known, why of several Cherry-tree Grafts, some bear Fruit the first Year; and others neither blow nor yield any Fruit till the Year after. Our common Gardeners can give no reason for it. All they know is, that it sometimes happens so, and not always. But such as are thoroughly knowing in the Art of Grafting, will tell us, that the Graft very seldom fails to bear Fruit the first Year, provided it be taken from a strong and vigorous Tree, and have Fruit-Buttons: otherwise 'twill shoot forth only Leaves, and not bear Fruit till the second Year. This Observation is very fine, and so nearly concerns the Utility of Gardening, that I cannot omit to give it in Boyle's own Words: *Nam a non uno in inferendi arte experientissimo accepi surculum cerasi, eo ipso quo insitus fuerit anno, raro infœcundum esse, modo prospiciatur ut a vegeta matre decerptus nodis florilibus, ut vocant, gemmescat: sin vero tantum foliaceos sive frondeos obtineat, non ante secundam*

estatem fructificaturum. Pag. 48. So true is it, that in the Business of Experiments, we ought always to proceed with much Care and Attention.

II. OBSERVATION.

HOW great soever are the Magazines of Provisions, that Nature hides in her Bottom, for the nourishment of Plants, in time they will waste and be consum'd. If we sow a Field for several Years together, without Dunging it, the growing Plants will drain away the Salts of the Earth, which for want of them will no longer be able to produce any thing. It must therefore be manur'd with Dung, or lie fallow for some Years, that it may recover its Saltiness by the help of Rains.

For this Reason, Recourse has in all times been had to *Stercoration*, that is to say, to the preparation of Dung, to restore to a Field its exhausted Fertility. However Painful and Laborious this method of Improvement of Lands may be, it has always been consider'd as a thing of the last Importance. The *Italians* plac'd *Stercutius*, one of their Ancient Kings, in the number of the Gods, for having first Invented the Art of Fertilizing Land by Dunging it. *Italia Regi suo Stercutio, Fauni filio, ob hoc inventum immortalitatem tribuit*, says *Pliny*. Hist. Nat. lib. 17. cap. 9.

The *Greeks*, who pretend to the Invention of all the Arts, say, that *Augeas*, King of *Elis*, who was so famous for the Dung of his Stables, that were fill'd with thousands of Cattle, was the first Inventor of *Stercoration*; and that *Heracles*,

ceus, who cleans'd those Stables of all the Dung, taught the *Italians* the secret of Dinging their Lands.

At this day our Husbandmen and Gardners employ themselves most times of the Year in getting together a Stock of the Dung of Animals. And 'tis certain that the Salts of their Urines, and other Excrements, are a great Help to the Vegetation of Plants. They search every where for this active Salt, that is most proper to excite and put in Motion the Germination of the Seeds. The Dunghill, the Dove-house, the Soot of Chimneys, the very Dust which they find in High-ways, help to restore the nitrous Substance, that is destroy'd or exhausted by a continual Culture. Other Means have been practis'd to make Crops the more plenteous. 'Tis related, that an *English* Gentleman us'd to cut his green Corn at certain Seasons, which made each Root or Grain produce even to a hundred Ears. *Oldemburgh* believes, that he us'd to roul it likewise with a Wooden Roller, to press it down.

Some say, that Corn, sown in its Ear, increases infinitely more than when 'tis thrash'd out. There are some, who when the Corn is in Flower, know which Ears are not subject to be blighted with a certain Mildew, that burns the Grain, and who preserve those Ears to sow them. The way to prevent this Blight is to beat down that Dew, when we see it fallen on the Corn; this may be done by holding a Rope stretch'd out, and drawing it over the Ears of the Corn. There are some, who to hinder this Mildew from burning the Corn, steep that which they intend to sow for the space

of twenty four hours in Brine, with which they mix some Bole-Armoniack; and then instantly sow it. This Secret likewise keeps the Birds from eating it.

From all these things we learn, that the Societies, compos'd of the most Learned Men, make it their particular Study to find out the secret of fertilizing the Earth, and of increasing the Fruits thereof.

III. OBSERVATION.

I Have here put together all the several Ways that are us'd for the Multiplication of Corn, that this Part of my Work might be of Use to all the World. Some of these Methods can not be practis'd, except with much Difficulty and Expence, in Countries where the others may be easily made use of. Of these many Prescriptions, we may not only chuse that which is most proper for the Country, but likewise form new Methods by these, which perhaps will succeed yet better. There are many substances in Nature, that abound in Salts; and all of them are of great Use for the Multiplication of Corn, and for the Vegetation of Plants. Mention is somewhere made of a monstrous Cabbage, which all the World went out of Curiosity to see. The Stalk was as big as a Man's Thigh, and upon it grew seven or eight Cabbages of a prodigious size. 'Twas suppos'd that the Place where it grew, had supply'd it with Plenty of Food, but 'twas never suspected what had made it of so extraordinary a Bulk; till the time came to pull it up; and then searching about the Root of it for the Cause of its huge Growth,

Growth, they found just by it an old rotten Shooe, that came thither by Chance, and had supply'd the Plant with such Plenty of Nourishment. So little is requir'd to assist Nature, that we have reason to be surpriz'd, that we have not more frequent Instances of these singular and wonderful Productions. Our Husbandmen, our Gardeners, and our Vine-Dressers, pursue the old Methods that their Fathers taught them, and which they can not easily be brought to change, for others that are more useful, and often less laborious. When we have attain'd to a certain Age, we scorn to be instructed in our Profession. We look on it as being sent to School again. How often did the old Physicians in the last Century take Arms against the Circulation of the Blood, which was then discover'd? They believ'd there was nothing in Nature for them to learn. How many sharp Disputes had they among themselves, to exclude the Use of Antimony, which was brought into Physick with so much reason and Justice? *The wise Man who hears, becomes more wise. Audiens Sapiens Sapientior erit, Proverb. 1. 5.*

CHAP. VII.

The Multiplication of Corn is grounded on Reason and on Experience. A like Multiplication may be made upon Vines, and Fruit-trees; and even in the Race of Animals.

WHAT we have said, in Regard to the Germination of Plants, gives us a great Insight into the whole Mystery of the Multiplication of Corn. For if it be certain that the Seed actually contains the Plant that is to grow from it, together with all the Seeds and all the Plants that are to spring from thence in the Succession of all Ages, 'tis a Step towards the Understanding of this Position, that to multiply Corn, we have nothing to do but to open the Treasure contain'd within the Bosom of each Seed, and to make it produce in one Year what it would not produce of it self in less than three or four. This is the whole Scope of our Design; and the main Business is to find an Agent, proper to open, to unfold a Part of what is contain'd within the Bosom of each Grain of Wheat. We say therefore that what we call Multiplication, is not a Formation of any new Parts; but only a Dilatation of the Bosom of the Seed. Within this Bosom, so little in appearance, but so fruitful and so vast to the Eyes of the Mind, is contain'd an Infinity of Sprouts, of little Embryo's of Plants, which the Succession of several thousands of Ages can not wholly produce, much less exhaust.

haust. This is above our Reach, and the Imagination loses it self in thinking on it; because this Extent of Fecundity that knows no Bounds; is above the Sphere of its Comprehension. The Mind, that alone has discover'd this Miracle, by an exact Inquiry, and by a certain Conclusion, ought only to take Cognisance of it. There is Corn enough contain'd in one single Grain to fill all the Granaries of the *Pharaohs*, Kings of *Egypt*.

St. *Augustin* well understood this surprizing Philosophy, as we see by what he says concerning the Wonders which Nature has conceal'd from our Eyes in each Grain of Corn. There are, says he, some things which we trample under Foot, and yet are astonish'd at them, when we consider them attentively. The Power and the Fruitfulness of Seeds is one of these things in which the Imagination loses its way, and knows not whither it wanders. *Quam multa usitata calcantur, quæ considerata stupentur; sicut ipsa vis seminum?* Epist. 3. ad *Volusian*.

If we consider what Nature does in Trees, we have reason to believe, that an intire Tree, its Root, its Trunk, its Branches, and perhaps its Leaves, are only a Composition of an Infinite Number of little Embryo's, from whom if Art would aid Nature, there wou'd spring an Infinity of Trees of the same Kind. This is what Nature would do, if she were assisted by Art.

When I say that the Trunk of a Tree, and even its Leaves, are only a Collection of little Embryo's of Trees, I speak in earnest. The whole Tree is only a Composition of Seeds; from whence other Trees can never be made to grow.

Johannes

Johannes Baptista Triumfetti, among the fine Experiments that he made, takes Notice of one that evidently proves my Assertion. He took a Plant of Spurge, and pull'd it to pieces, and planted them. From every little Piece there came as many Spurges of Different Kinds; that is to say, the Wood-Spurge, the Cipress-Spurge, and the Mirtle-Spurge. This was a new Method of Propagation; and what is most remarkable in it, was the Variety of the Kinds; tho' they all came from the Spoils of the same Plant. *Inter alia Tentamina curiosa notavit e minimis frustulis Titbymali variarum Specierum enatas Plantas, Titbymalum Chariacam, Myrsinitem & Cyparissinam.* Act. Eruditorum, Aprilis, 1686.

So true it is, that in Plants, all is only Grain and Seed; and the main affair is to open and unfold all these Seeds, that are concenter'd in the whole substance of each Vegetable, and to make them germinate.

These Truths will be yet more manifest, if we make the following Experiments on a Willow.

Cut off the Head of a Willow, There will spring out at the Top and along the Trunk, a hundred Shoots and new Branches, of which there was not before the least Sign in the Places where they shoor. And if you cut off these Shoots, others will spring out elsewhere.

These hundred Shoots, after a certain time stuck into the Ground, will produce each of them a hundred other Willows.

These ten Thousand Willows, when they come to be lopt in like manner, will produce each of them likewise a hundred more. Thus we have a Million; then a hundred Millions:

next

next come the Tens of Bimillions; then the Trimillions; insomuch, that unless a Man be a Mathematician, he will be lost in this Calculation, and forc'd to give it over. If to all these Willows we add those that the Willow we first lopt, shall continue to produce likewise, and if we carry on the Geometrical Progression farther; this Posterity of Willows will rise so high, as even to puzzle a Mathematician himself. So vast are the Riches, so immense the Treasures of Nature!

The Multiplication therefore of Plants is only the unfolding of the Sprouts that are center'd, wrapt up, and infolded in the Seed. In a Corn of Wheat, besides the principal Stalk that is to spring from it this Year, there are others contain'd which I call Lateral or Twins, that would spring out likewise, if they were unfolded by any Agent, indu'd with a generative Power. Nay more: the chief Stalk that contains a numerous and real Posterity, may be open'd by the same Principle of Germination, and produce the first Year, what it reserv'd for the Years following. Thus the whole Aim of our Multiplication is only to obtain in one Year, by the Means of Philosophy, a Crop, which we could not have by the common Methods of Husbandry in less than three or four. Besides this Sprout, which discovers it self by a green and hopeful Stalk, there is in this single Corn of Wheat, an infinite Number of others, which wait only till we break their Bands, and set them at Liberty to spring forth likewise. The Liquor we make use of to macerate the Seed, serves only to hasten and advance a Germination, which an unskilful Husband-

Husbandman abandons to the following Years. 'Tis a sort of *Superfetation*, by which one Grain of Corn conceives and brings forth several Young, that in the common Course of Nature ought to be born successively and in different Years.

Sometimes Nature produces of herself these hasty Births, these *Superfetations*, which are Monsters in the Race of Vegetables. For Example.

The Learn'd of Germany speak of a wonderful Lemmon, that contain'd two others, one of which was very perfect, ripe and full of Kernels. The other was only an Embryo of a Lemmon. *Ephemerid. Curios. Nat. 1673. Observat. 54.* In the same Place mention is made of a treble Rose; or rather, of a Rose, from which there Sprung out two other distinct Roses, one above the other. *Observat. 55.* Doubtless these premature Productions were the Effect of some saline Humour of the Earth: And two of these Roses, which ought not to have appear'd till the Year 1673. came out in 1672: We are of the same Opinion concerning another Rose, from whence Sprung out a Second that was all white, beautiful, and had abundance of Leaves and Buds.

In *Observation 141.* They speak of another Lemmon, that contain'd likewise a second of a Singular Beauty.

The Learned Jesuit *Ferrari* teaches us that these *Superfetations* and Monstrous Productions are frequent enough in *Tuscany*; especially near the Sea-side, and in the Neighbourhood of *Pietra-Santa*; because, says he, the Saline and warm Vapours of the neighbouring Sea make

make all Nature thereabouts brisk and active: The Lands are there so fruitful, that there reigns an eternal Spring. The Trees are always in Blossom, and burst with the Excess of Nourishment, with which the Soil supplies them; and in every Corner of the Fields we see Twin-Fruits; Superfetations unknown elsewhere, and a hundred Monstrous Vegetations: *Provenire Limonem prægnantem in Hetruria, ac propter Maris proximi egelidi habitum mare fertili. Arbascula ut flore assiduo ver agere perpetuum.* Hesperid. lib. 2. cap. 9. pag. 263. This learned Naturalist farther observes, that there are no Trees in which Nature plays the Mimick more than in the Citron-tree. There we find Citrons, that have Fingers. There are some on which a Hand is expressly figur'd: others have two Hands join'd together. Upon which Occasion he says very well, that all-sportful Nature divers herself in making the Trees produce human Shapes: *Ex arboreo partus partes audet humanas ludere.* Hesperid. lib. 3. cap. 6.

The Observation 115. describes to us three Plants of Rye, that were loaded with an Extraordinary Number of Ears. They have not forgot to observe that they grew in a moist Place, which had supply'd them with whatever their Appetite could crave. But all this is the Work of Chance, and the Industry of Men has no Hand in it.

Husbandmen therefore by their Skill and Labour must assist Nature in these Germinations, to which she is of herself inclin'd. I cannot repeat it too often. There is in one single Grain of Corn, that has thoroughly germinated

minated, wherewith to feed the five Thousand Men whose Hunger our Saviour satisfy'd on the Mountain with five Barley-Loaves. St. *John Chap. 6.* St. *Augustin* who was no less a Philosopher than a Theologian, speaking of this Miracle, says, 'tis astonishing to see Men so struck with Admiration at it, when at the same time they are not in the least surpriz'd at the daily Works of God, which are incomparably more miraculous; such are the Works of Providence, by which he governs the World, and presides over all nature. We are not astonish'd at these Wonders because we see them every day: *assidue videntur.* Thus too no man reflects on this inexhaustible Treasure, which God has shut up in each Grain of Corn: *Ita ut bene nemo dignetur attendere opera Dei mira, & Stupenda in quolibet seminis grano.* We are amaz'd at the feeding of five thousand Men with five Loaves, because we reflect not that the Power which multiply'd those five Loaves in the Hands of our Saviour, is the same by which every Year some Seeds that are sown, yield us such plenteous Crops. These five Loaves were as Seeds, not indeed deposited in the Earth, but in the Hands of him who made the Earth, and impregnated it with all the Salts from whence the Seeds yearly derive their Fruitfulness: *Panes autem illi quinque quasi Semina erant, non quidem terræ mandata, sed ab eo, qui terram fecit, Multiplicata.* Tractat. 24. in *Joban.*

Dodart, speaking of the Multiplication of Corn by Art, says: I long believ'd that one Grain of Wheat could not shoot out above one Stalk: but I have now by me two Plants of Wheat, one of which has more than a hundred

dred Stalks, and the other more than Sixty. He who gave them to me, made use of them to prove, that a Liquor in which he had steep'd the two Grains of Wheat, from whence grew these two Plants would infinitely increase the natural fruitfulness of the Wheat. I omit the Method of preparing this Liquor, tho' what he asserted of it may be true, at least in Part, seeing the Abbot Gallois has made several Tryals of it, but always with less success, having never had more than ten or twelve Stalks from one Grain.

If one single Grain can be thus increas'd into many Stalks, and if the Preparation be the Cause of it, 'tis certain that this Humectation opens the Passage for the Sprouts contain'd in the Grain: so that if it be sown in a succulent and well-cultivated Earth, it there finds all the Juice that is requisite to make it produce whatever Nature has enabled it to bring forth. *Memoir. de l'Academ. R. des. Scienc. 1700, pag. 157.*

Dodart speaks afterwards of another sort of Wheat, whose Fruitfulness is indeed astonishing. I saw, says he, at the President *Tambannau's*, two Plants of the Wheat, which G. B. calls, *Triticum spica multiplici*. One of them had thirty two Stalks, and ten Ears upon each of them. Each Ear had thirty Grains, and the Ear in the middle of the Stalk, thirty six. If we multiply all this, we shall find three Hundred and twenty Ears, and nine Thousand seven hundred ninety two Grains of Corn produc'd from one single Grain. *Pag. 159.*

From the Reasons and Experiments which I have reported it may easily be guess'd, that this Multiplication may likewise be effected on
Vines

Vines and on Fruit-Trees. This is an evident and necessary Consequence of the Principles I have laid down, and they who are accusom'd to argue syllogistically need not be told so. There is nothing therefore to be done, but to know the Method of effecting it.

1. If we plant Vines or Trees, we make a Hole as usual; but the broader the better. At the Bottom we lay two Inches of good Earth, and there place the Vine or the Tree: then put to the Root some of the Matter mention'd in the second Multiplication. If we allow a good Quantity of it, the Plant will vegetate and blossom the sooner, and bear the greater Plenty of Fruit. Then we throw Earth upon it, and do nothing more to it for fifteen Years or more. During which time it requires neither Digging nor Dunging, and will bear Fruit the second Year.

If the Vines or the Trees are already Planted, we uncover the Foot of them to within an Inch of the Root, and pour in like manner upon it some of the Liquor of the second Multiplication: which done, we throw the Earth again upon the Roots, and it will require no more of us for fifteen Years together. Only we take Care to pull up the Weeds, that may chance to grow at the Foot of the Plant, and that would rob it of its Nourishment.

The Trees we cultivate in this Manner revive afresh, become strong and full of Sap and Vigour. They bear a surprizing Quantity of Fruit, better tasted, and much larger and fairer than usual. And what is yet more considerable; no ill Weather can hurt them.

After

After having spoken to Husbandmen, we must likewise encourage such as cultivate Vineyards, and assure them, that if they dress their Vines in this Manner, they will have more plenteous Vintages, they they durst even hope to have had.

The Florists too will have Cause to triumph, since by this Means they will have Flowers more double, more large, more lively and more variegated than any that the richest of their Parterres have ever afforded them. No way like this to render *Flora* so propitious to their Vows. Whether their Flowers come from Seeds, from Bulbs, from Roots, from Slips, from Suckers, &c. from this *Universal Matter*, well prepar'd and duly apply'd, they may hope for wonderful Productions in the Empire of that Goddess: they will not only have more Flowers but larger; and of a more exquisite and Delicious Odour.

The Gardiners, who apply themselves to cultivate Kitchen-Gardens, will make their Fortune by it. Methinks I already see our Markets supply'd with Cabbages, Lettuce, Succory, Melons, &c. of a Size, Taste and Flavour, to which past Ages have seen nothing comparable. We shall have Beans and Pease three Weeks earlier, and Strawberries in the Season when they commonly but begin to blow.

Let us now leave our Corn-Fields, our Fruit, and our Kitchen-Gardens, and go into the Yards where we keep our Cattle and our Poultry. Delightful Plenty ought to reign every where. The Race of Animals deserves no less the Wonders of Multiplication than the Race of Vegetables.

M

Animals

Animals will thrive and grow prodigiously, if we moisten their Bran, and steep their Corn in the Liquor of Multiplication. Cleanliness no doubt is requisite, and this Liquor for them ought to be prepar'd with more Neatness than that for Corn, in which even Filth and Mud are usefully imploy'd. I advise therefore to prepare a Liquor on purpose for Animals, which should be well filter'd, and Nitre the Main Ingredient of it; to which I would only add the Salts extracted from Plants that are either in Flower, or in Seed. I leave the rest to be improv'd by those who love the innocent Cares of a Country-Life, having hinted enough for such as are more knowing in those Affairs than my self to make a farther Progress in these Discoveries.

I know by Experience, that a Horse, in whose Oats a little of this Liquor was put, has perform'd Services beyond all Expectation. He would boggle at nothing, and no Fatigue could weary him. If the Grooms would make use of this Secret, there would not be so many Horses lost in our Armies; the rather because it would protect them from the contagious Diseases, that are frequent in Camps.

Our Farmers and Carriers, who are often undone by the Loss of their Horses, Oxen, and other Cattle, would no longer be expos'd to the like Ruin. Their Cows will indemnify them for the Expence of this Liquor by an extraordinary Abundance of Milk, and their Hens will doubly repay them in Eggs.

Since therefore of all the Parts of Husbandry, that which relates to Cattle is the most profitable, and for that Reason has always been preferr'd to the Culture of Corn and Vines, we

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can not too much value a Secret that tends to the Increase of them. The richest Patriarchs were not Husbandmen nor Vine-dressers, but Keepers of Flocks and Herds, and Pasture Lands have in all times been the most gainful.

OBSERVATION..

I. **W**ithout the least Exaggeration we may safely assure, that by this Multiplication the Revenue of a Country-Estate will increase considerably. I suppose that the different Manners we have propos'd whereby to multiply Corn, will be practis'd very imperfectly; and that the Crop will fall short of what some have told us of this Secret; that is to say, that the Multiplication commonly amounts to two hundred and fifty Ears upon one single Stalk. I suppose only twenty, one with another, tho' on a great many Stalks there will be more. Now supposing that by the usual way of Culture there be four Ears on each Stalk; an Estate that yielded in Corn a Thousand *Livres* a Year, will yield five thousand; and one of five thousand will be worth twenty five thousand. In this I stretch not in the least.

II. The other Advantages are these. 1. The Ground never lies fallow. 2. 'Twill bear Wheat every year. 3. It requires no Dung: but if you have some, and know not how else to bestow it, 'twill do no harm. 4. One Tillage is sufficient. 5. We sow but half the Quantity of Seed, or but two Thirds at most. 6. Fewer Horses or Oxen are requir'd to Plough it. 7. The Corn holds out the better against the great

Rains and high Winds, which generally lodge it: The Stalks are the stronger, and the more easily keep themselves upright. 8. 'Tis less subject to Blights, and defends it self the better from the Mists that mildew Corn, when 'tis ready to ripen. 9. In good Soils, the Roots will shoot out new Stalks for the second Year; and thus without ploughing or sowing we may have a second Crop. 10. All skillful Husbandmen dread nothing more than a backward Harvest and Vintage, because they are liable to great Inconveniencies, and are generally not good. By the Help of our Multiplication, both Corn and Grapes will be ripe fifteen Days the sooner. 11. We reflect not, say the Naturalists of *Germany* in their Journals, on the Causes of the Epidemical Diseases that sometimes rage both in City and Country. They proceed from the Corn that is spoil'd by Mildews, and from the unhealthy Rains that fall when the Harvest begins to ripen. The sharp Wines contribute likewise to them. The Spotted Feavers that took off so many Souls in the Years 1693, and 1694, were occasion'd by the Corn that was spoil'd in Harvest, and by the Wines that were made of Grapes not fully ripe. The Multiplication by Nitre, prevents the Intemperance of the Season, and the noxious Vapours of the Air from hurting the Corn and the Vineyards. The Nitre that predominates in it, excludes every thing but the Nitre of the Air, and prevents Corruption. This Salt was an Ingredient of the Composition, with which the *Egyptians* embalm'd the Bodies, which they intended to preserve against all the Attacks of
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Rottenness: wherein they succeeded to Admiration.

De la Perriere had the Secret of the Multiplication of Corn, and I have seen at his House and elsewhere some Experiments, that undeniably justify the Truth and Reality of it. But he valu'd it at so high a Rate, that he thought it could not be purchas'd according to its Worth; and therefore often declar'd that he never had, and never would teach it, except to some Prince, who was desirous to promote the Good of his Subjects, and to sow Plenty among them. He kept his Word; for he dy'd towards the End of the Year 1704, without having ever discover'd it to any Man. Yet I know from good Hands, that he had not absolutely determin'd the Method of it, and that he was endeavouring to bring it to Perfection at the time of his Death. The little that was found in his Papers concerning it, gives ground to believe, that our second way of Multiplication is the same he made use of; and what intirely confirms me in this opinion, is the Care he took to make his Servants gather up all the Ingredients that are imploy'd in the Composition of the *Prepar'd Water*, and of the *Universal Matter*.



CHAP

C H A P. VIII.

Nitre is the Salt of Fruitfulness ; and its Virtue is wonderful for the Multiplication of Vegetables and of Animals.

Nitre and Salt-peter are the same thing: and if there be any Difference, 'tis only this, that Nitre is a purer and finer sort of Salt-Peter than the common sort of it. No Philosopher has given a better Definition of Nitre than *Lemery*. 'Tis, says he, a Salt impregnated with many Spirits of the Air that render it volatile. This Salt is taken from amidst the Stones, Earth, and Rubbish of old ruin'd Buildings, as may be seen at the Arsenal of Paris, where we make the best Salt-peter in Europe.

Nitre is of great Use in Chymistry, and in Physick. Mineral Crystal, *Sal Polychrestum*, *Aqua Fortis*, and Spirit of Nitre, which of all the sorts of *Aqua Fortis*, is the best for the Dissolution of Metals, are made of it. But let us leave Nitre in the Hands of Chymists and Physicians to make what use of it they please, and consider it only in Regard to its Faculty of contributing very much to the Propagation of Plants and of Animals. We will only observe, that the Chymists, who have made the Analysis of it, find in it a Salt, intirely like to that, which they call *Sal Gemmae*. Nay 'tis certain, that if we let Salt-Peter boil long in Water, its Spirits will evaporate ; and nothing remains but a Salt like our ordinary Salt that we eat every Day. This gives Ground to believe, that Nitre or Salt-Peter is only the common Salt, fuller of Spirits than

than it usually is. Thus we shall see in the sequel of this Discourse, that the Salt they call *Sal Gemma*, is of no less Efficacy in the Multiplication of Corn, than Salt-peter itself; and that in regard to that Affair, there is but little Difference between them. Thus all the Mighty Praises with which the Excellence of Salt has in all times been celebrated, are as justly due to Nitre.

Before *Plato's* Days, Books were written on purpose to extol the Praise of Salt; and that Philosopher mentions one of them in his Treatise, intitul'd, *Convivium*. He himself gives to Salt the Epithet *Θεῖον*, and scruples not to say, that Salt is the Object of God's particular Affection: *Sal Deo amicum Corpus*: This Passage is in his *Timæus*; and he may well be thought to have conceiv'd this Opinion, by reading the Books of *Moses*; from whence he certainly took many things that he has mingled among his own Works. This gave *St. Clement of Alexandria* occasion to say that *Plato* was only *Moses* speaking Greek; *τί γὰρ ἐστὶ Πλάτων ἢ Μωϋσῆς ἀτλιχίζων*. *Quid enim est Plato, nisi Moses qui loquitur Attice?* *Stromat. lib. 1. pag. 342.* And indeed, what *Plato* says of the Love that God has for Salt, agrees intirely with what *Moses* says concerning the Oblations, which were all to be season'd with Salt, that they might be acceptable to God. And every Oblation of thy Meat-Offering shalt thou season with Salt; neither shalt thou suffer the Salt of the Covenant of thy God to be lacking from thy Meat-Offering: with all thy Offerings thou shalt offer Salt. *Levitic. ch. 2. v. 13.*

The Heathens too imagin'd that their Gods took part in what happen'd to Salt. *Athenæus* relates that there was at *Tragajæ*, a Mine of Salt, where any Man was free to take as much as he wanted; but that King *Lyfimachus* had no sooner laid a Tax upon it, than all the Salt disappear'd, and the Mine was exhausted. That Prince, says *Athenæus*, took off the Impost, and the Salt return'd again in as great Plenty as before. *In Troade licebat volentibus Tragafæum Salem capere, qui cum Lyfimachus tributum imposuisset, continuo evanisset. Cum postea locum, ob admirationem, immunem iterum reliquisset, Sal iterum crevit.* Lib. 3. cap. 1.

If the Use of Salt be of some Moment in religious Observances, 'tis of much greater Service in the Affairs of Life. The Oriental *Tatars* cannot be without it. They no sooner leave it off, than their Blood corrupts, their Lips and their Gums grow Rotten, and they are seiz'd with mortal Dysenteries. *Marc. Paul.* lib. 2. cap. 38.

In some Parts of *France* they give Salt once a Week to their Horses, their Oxen, and to all their Domestick Animals; who without it are taken with a Mortality that sweeps them away.

Vossius believes that Salt was call'd a thing divine, because of its Virtue in preserving from Corruption. *De Idololat.* lib. 6. cap. 18.

The Romans gave not the Name of Sacred to their Table, till the Salt was plac'd upon it. When the Saltfeller was wanting, the Table was look'd on as Profane. *Sacras facitis mensas salinorum appositu.* *Arnob.* lib. 2. Let us now proceed

ceed to what relates to the Multiplication of Corn and of Animals.

I. 'Tis not for the Quibbles sake that *Pliny* said; *Sale & Sole nil totis corporibus utilius*: that nothing is more useful to all Elementary Bodies than Salt and the Sun. *Hist. Nat. lib. 31. cap. 9.* But the Deep Knowledge he had in the Works of Nature made him use that Expression. According to him, Salt is the most Delicious part of the Food we give our Bodies; as witty Sayings, ingenious Repartees, Apophthegms, ready and pleasant Ralleries are the Delights of the Mind in the Conversations of the Learn'd: therefore, says he, the *Latins* call'd them *Sales*. And seeing the Rewards and Honours, with which Merit and Virtue are recompens'd, are the sweetest Charms of Life, when we enjoy them in a glorious Retreat; therefore, adds *Pliny*, they call'd the Pensions and Salaries that were granted to the Officers of the Army *Salarium* *Ergo Hercule vita humanior sine sale nequit degere: adeoque necessarium elementum est, ut transferit intellectus ad voluptates animi quoque. Nam ita sales appellantur, omnisque vitæ lepos, & summa Hilaritas, laborumque requies non alio magis vocabulo constant. Honoribus etiam militiæque interponitur, Saliis inde dictis.* *Hist. Nat. Lib. 31. cap. 7.*

He knew very well that there are some Plants that grow much better in Salt Waters than else where; and that the Salt contributes not only to their Multiplication, but likewise to give them a better Taste. *Peculiaris Medicina Raphano, Betæ, Rutæ, Cunilæ in salsis aquis, quæ & alioqui plurimum suavitati conferunt.* *Hist. Nat. Lib. 19. cap. 2.*

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He therefore regards not the Shrubs, the Fruit Trees, and the vast Forests that grow at the Bottom of the *Red Sea*, of the *Indian Sea*, and of the *Mediterranean*, to be any thing extraordinary. *Nascuntur & in mari frutices, arboreesque minores in nostro. Rubrum enim, & totius Orientis Oceanus refertus est sylvis.* Hist. Nat. Lib. 13. cap. 25. Which Chapter is a curious Enumeration of all the Trees that have been observ'd to grow at the Bottom of the Sea. And what is wonderful indeed, is that the Lands that lie in the Neighbourhood of these Maritime Forests, produce nothing, and are only wild and hideous Desarts.

As there are Forests at the Bottom of the Sea, so there are Meadows on its Surface. *Francis Oviedo*, who has written the Navigation of *Christopher Columbus*, says, that in the open Sea, and above two hundred Leagues from Land, they found the Surface of the Sea cover'd with green Meadows for above eighty Leagues together. So true it is that many Plants are fond of briny Nourishment.

To this we add, that the prodigious Fruitfulness, which with astonishment we observe in Fish, proceeds no doubt from the Saltness of the Sea. This too is the reason, says *Pliny*, that there are in the Sea, Animals much bigger than any upon the Land. *Sunt complura in Mari majora etiam terrestribus, Causa evidens, humoris luxuria, &c.* Hist. Nat. Lib. 9. cap. 2.

Vallesius, Physician to *Philip II.* of Spain, is absolutely of Opinion, that Salt contributes very much to the Fertility of all things: and in answer to those who think otherwise, he says; I believe, that wherever Salt is exceedingly

ingly predominant, there can be no Generation. From thence proceeds the horrible Sterility of the Sea of Sodom, which is call'd the dead Sea: and is extreamly Salt. No Animal can live in it: throw in a Fish, it expires immediately. But when there is but a moderate Degree of Salt, as in the Sea, it renders the Waters very fruitful. There is not in any part of the Universe, so violent a Lust for Propagation, as among the Inhabitants of the Sea: Nor can any Fathers be found elsewhere, who can count so numerous a Progeny, as the Fish can boast of. *Cum Salsugo intra quentlam Mediocritatem est, ut in mari, ipsas aquas facit-fecundissimas: nulli enim mundi, adeo luxuriatur generandi facultas, neque est tam multiplex generatio.* DeSacr.Philosph. cap. 34. Thus Salt is the Principal of the Fruitfulness of Animals.

De la Chambre is intirely of the same Opinion. Whoever, says he, will search into the Principle of the fecundity of Animals, shall find there is no other than Salt; for the Seed of all of them is Salt. Therefore the Poets, who were the first Philosophers, feign'd that *Venus* was the Daughter of *Oceanus*, and that the Goddess *Salacia* was his Wife; to teach us that Salt is the Principle of Fertility; and that there is no Element so fruitful as the Sea, which produces Animals in greater number, and more variety, larger, more sound, and longer-liv'd, than any of the other Elements. Thus too the Poets always gave more Children to the Gods of the Sea, than to the Gods of the Earth. And the Priests of *Isis*, who knew this Virtue of Salt, never made use of any, that they might preserve themselves in the Purity, which their Function

Function requir'd. It has been observ'd, that Sea-faring Men, who eat Salt Mears, have more Children, and are robust than others; and that the Sheep that eat the Salt Grass that grows on the Sea-shore, have more Lambs, and are better tasted. *Discours du Debordement du Nil. 1. Part. Art. 5. Pag. 18.*

2. After this ought we to be astonish'd at what *Vigenerus* says in his famous Treatise of *Fire and of Salt*; that Salt is the first Origin of Metals, of Plants, and even of Animals. 'Tis, says he, the Life of all things. Without Salt Nature can produce nothing: nor can any thing be ingender'd: and to this all the Chymical Philosophers adhere. Nothing better, or more valuable than Salt, was created here below in this Elementary World. There is therefore Salt in all things; nor could any thing subsist, were it not for the Salt that is mixt with it, and binds the parts together; otherwise they would crumble into impalpable Dust. *Pag. 242.*

He concludes his Treatise by an Observation intirely to our purpose, and that proves how much Salt contributes to the Vegetation and Multiplication of Corn, and even of Grapes. We see, says he, that on the Banks of the Salt Marshes of *Xaintonge*, that are rais'd with Mud, as Salt as the Sea itself, there grows as good Corn as ever was seen, and in great abundance; as also very excellent Grapes. *Pag. 266.*

3. *Palissy*, who about the beginning of the last Age, publish'd his Book, intitul'd, *The Way to grow Rich*, argues in the same Manner with *Vigenerus*: He is an Adorer of Salt, and gives it a share in every thing. Without Salt, no-
thing

thing could prosper in Minerals, in Vegetables,
 or in Animals; but all would fall to Ruin. He
 says, there is so great a number of Salts, that
 no Man can name them; that there is nothing
 in this World, but has some Salt in it; that
 there is a Salt in Man, in Animals, and in
 Plants, that no vegetative things could vegetate
 without the Action of the Salt, that is, in their
 Seeds. Nay more, that if the Salt were taken
 from the Body of a Man, he wou'd fall into
 Dust in less than the Twinkling of an Eye; that
 if the Salt were separated from the Stones of
 a Building, the whole Edifice would inevitably
 tumble down in a Moment; that without it Iron,
 Steel, Gold, Silver and other Metals, would crum-
 ble into Dust likewise. Some say, that nothing is
 more prejudicial to Seed than Salt; but I know
 for certain, that on the Banks and Cawseys of
 the Salt Marshes of *Xaintonge*, there grows as
 good Corn as ever was seen: And yet those
 Banks are rais'd with the Mud of the same
 Marshes, which is as Salt as the Water of the
 Sea. Moreover, the Vines of *Xaintonge*, that
 are planted in the midst of the Salt Marshes,
 bear a kind of black Grapes, of which they
 make a Wine, not inferior to *Hippocras*; and
 the Vines are so fruitful, that one of them bears
 more Grapes, than six of the Vines about *Paris*.
 In the Rocks of the Islands of *Xaintonge*, there
 grows an excellent sort of Samphire, that has
 a delicious smell, occasion'd by the Vapours of
 the Sea. 'Tis very good in Sallets. Endeavours
 have been us'd to cultivate some of it at *Paris*,
 but to little Purpose; for, 'tis not near so good
 as that which grows in *Xaintonge*, whose briny
 Soil bears Fruits of all sorts, that are more de-
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licious than any that grow elsewhere. If I knew all the several sorts of Salts, I should be able to do Wonders: *Pag. 221, &c.* This is a great confirmation of our Opinion, concerning the Multiplication of Corn.

Cosmopolite, who is so obscure in many Places, and so impenetrable in others, is very plain and intelligible on the subject of Salt. He calls it *the universal Spirit of the World*. This *Saturn*, says he, Son of *Cælum* and *Vesta*, who are the Heavens and the Earth, and Husband of his Sister *Ops*, who is the preservative Virtue of all things, represents the *Demogorgon*. For what are the Children he devours and vomits up again, but the Minerals, Vegetables and Animals. He gives their Being to these three Kinds, and they, when their end arrives, resolve again into him, that they may take again a new Figure: to the End that by this perpetual Vicissitude, the Order, that has been establish'd from the Beginning of the World, for the Succession of all Generations, may for ever maintain and preserve itself. This is certainly true in Physicks, but will not easily be understood by such as have never reflected on the perpetual Circulation, by which Nature incessantly repairs by Salts, whatever falls to decay and is destroy'd. But in the next Place let us hear *Glauberus*, who will help us to understand this wondrous OEconomy of Nature.

5. *Glauberus* celebrates at every turn the Virtue of Nitre. According to this excellent Chymist, Nitre is the only Principle of the Vegetation of Plants, of the Generation of Animals, and of the Augmentation of Metals. *Sal-Ni-*

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trum est unica Vegetatio, Generatio, & Augmentatio omnium vegetabilium, Animalium, & Mineralium. De Mercur. Philosoph. Sect. 68. He labours all he can to prove that Nitre is the Mercury of the Philosophers. What do you think, says he, that the Philosophers meant by their Mercury; which at once is Male, and Female; fix'd, and volatile; light, and heavy, dry, and moist; soft and corrosive? Under this Riddle they describe Nitre to us: *Cui rei, excepto Nitro, hoc Philosophorum Enigma congruit?* 'Tis Nitre they represent to us under the Figure of a Being blacker than a Crow, whiter than a Swan, more hurtful than a Serpent, more innocent than a Lamb, lighter than the Wind, and heavier than Gold. 'Tis a Father who devours his Children; 'tis the Azoth of the Philosophers. All this agrees with nothing but Nitre. 'Tis the *universal Dissolvent*. Once as I was melting Gold in a Crucible, I from time to time threw in Flowers of Salts, to hasten the Fusion. This succeeded very well. When I judg'd the Gold to be melted, I took the Crucible off the Fire; and thinking to pour out melted Gold, nothing came out but Lead; and immediately after it a red Powder, tinctur'd with the Soul of the Gold, that had lost all its value. I several times in vain endeavour'd to do the like again; and had I succeeded, I should at this time have been the happy Possessor of the Philosopher's Stone: but I could never since hit upon the just Degree of Fire, nor the due Proportion of Matters. The learn'd *Paracelsus* said very well; That the main Point of the grand Operation consists in Nitre. *Chymia deprehendit rem in Nitro latere.*
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The whole Art of Chymistry depends on Fire and on Salt. *In igne et Sale magisterium consistit.* This is the Salt that ascends from the Abysses of the Earth into the Region of the Air; from whence it descends impregnated with the Siderial Influences, and diluted in the Waters of Rains, of Snows, and of Dews, to give Fertility to the Earth. This is what the great Hermes meant to represent to us in the *Table of Emerald*, when he said, that *what was above was the same that is beneath. Idem est superius quod est inferius.* 'Tis a little wingless Bird that flies Night and Day, and is never weary: that goes from Element to Element and conveys the Spirit of Life to the Elementary World. By a perpetual and uninterrupted Circulation, it ascends from below, and descends from above. It produces Minerals, Vegetables, and all Animals. It never perishes, but changes only its Figure. If it enters into Animals under the Appearance of Nourishment, it goes out from them under the Veil of Excrement: thence it returns into the Earth, to rise up in part into the Air, by the way of Vapours and Exhalations: and thus we have it again in the Elements. It returns into the Roots of Plants; and thus we have it again in Nourishment. So that its Circulation is from the Elements into Aliments, and from the Aliments into Excrements, that it may return into the Elements. *Elementa in Excrementa, & hæc in Alimenta redeunt, indefinente renovatione, ac transmutatione.* Glauber. de Mercario Philosophorum.

It cannot be deny'd that there are many curious things to be met with in the writings of the Chymists. This Circulation of Nitre is
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the true mechanical Order that Nature observes in her Works. At the End of Autumn we see the Leaves drop from the Vines: they fall only to restore to the Earth, by Rotteness, the Salts they had receiv'd from it by Vegetation. The Nitre, set at liberty by the Dissolution of those Leaves, will appear again upon the Scene; when the Heat of the Sun, mounted to the Equinox, seconding the Heat of the Subterranean Fires, forces the Juices of the Earth into the Roots of the Vines, to form for *Bacchus* a Garland of new Branches. Thus the Face of Nature changes only to become again the same: its decay is only in order to its Repair: its Ruins are the Cause of its Riches: nothing is lost; nothing annihilated: what disappears, comes in sight again, and what changes, retakes its former Place. Thus Nature is always the same: And to speak freely, whoever is ignorant of this perpetual Circulation, in which the whole Harmony of the elementary World consists, is so far from deserving a Place among Philosophers, that he is unworthy to be counted among the Race of Man.

The Academy *Curiosorum Naturæ* of Germany say, that 'tis believ'd among the Learn'd that *Glauberus* invented this *secret Menstruum*, this balsamick Liquor for the Multiplication of Corn and of Vines: *cujus Inventor Glauberus creditur*. Annus 1. Observat. 102. pag. 213. But if he was not the Inventor of it, at least he had it. He says in his Treatise *De Mercur. Philosoph.* That if the Tillers of Vineyards put a little of this Liquor to the Roots of their Vines, they would have forward Grapes; and Wine which would sell very Dear. He adds,

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that if Husbandmen steep'd their Seed-Corn for sometime in this *universal Menstruum*, they would have an early and plenteous Crop: Si *Vinitores de hoc subjecto pauculum vitium radicibus affundant, uvas præcoces habebunt; mustumque præmaturum care divident.* pag. 46. Si *agricolæ semen hoc menstruo humectatum in agrum spargunt, citius maturefcit, granis pinguioribus.* pag. 50. All he has reveal'd to us of this Secret is, that Nitre works all these Miracles. Chymists are never communicative. At length after having said that this very Liquor heals all the Diseases of Mankind, he concludes with declaring, that Salt, duly imploy'd, is the sole and only Principle of the Preservation, Increase and Perfection of Vegetables, Animals and Minerals. *Sal enim debito more adhibitum, unicum esse Vegetabilium, Animalium ac Mineralium, conservatorem, auctorem, & perfectorem.* pag. 71.

6. The Royal Society of England, who are so zealous for the Perfection of Agriculture and Gardening, have apply'd themselves with great Care to find out the true way to make Salt-peter, which they likewise allow to be the chief Promoter of the Vegetation of Plants. *Henshaw*, after having prov'd that our Salt-peter is the same thing as the Nitre of the Ancients, says; Salt-peter is a Body that is made by the Coagulation of the volatile Spirits, of which the Air is full: and it sticks like Wheat-Flower on Walls made of Plaister, Brick or Mortar. The Dews and the Rains convey a great Deal into the Earth: and the Clouds seem to be extended before the Face of the Sun, only to imbibe some Part of his Influence:

or

or that a Salt may be engender'd in their Bosoms, to increase the Fertility of the Earth: and certainly they fall not without Benediction; for I have more than once extracted Salt peter from Rain-water and from Dew; but this last yields most. Standing Pools, and the Water of deep Wells contain all of them a little: But what is most certain is, that if the Surface of the Earth were not impregnated with this Salt, it could not produce any Plants. For Salt, as my Lord Bacon says, is the first Principle of Life, and Nitre is the Life of Vegetables.

Now to prove that Snow actually contains a great Deal of Nitre, we need only have Recourse to the *Philosophical Transactions*; where 'tis related that Dr. Beale often consulted the Gardiners, and among other things enquir'd of them whether the Sun by its Heat, or the Cold of the Winter contributed most to render the Earth fruitful; and that all of them agreed, that Cold, and especially Snow, hasten the Maturity of Fruits, and produce a more general and plenteous Fertility. *Immocuncti affirmant frigus, & nivem citius apud nos maturare fructus, & inferre universaliorē & locupletiorē fertilitatem.* Act. Philosoph. Februarij, 1670.

Dr. Stabbes says, that he has observ'd that the Plants which grow in a nitrous Soil are in Seed a month sooner than other Plants of the same Kind, that grow elsewhere. Act. Philosoph. Junij. 1668. Our Multiplication therefore advances very much the time of Harvest.

7. Stephen de Claves calls Nitre the Seminal, Vegetable, Balsamick Salt, by reason of

its Virtue in giving Fruitfulness to Plants. During the Winter, says he, the Subterranean Heat redoubles, by the Multiplication of the Vapours and Exhalations, that continually rise from the deepest Entrails of the Earth. These Steams, not finding a free Issue thro' the Pores of the Surface of the Earth, that are clos'd and stopt up by the Cold, warm and foment themselves, circulate round the Roots of Plants, and give them an ample Nourishment by augmenting the balsamick Salt, which then insinuates and mixes itself in the Roots. But in the Spring, the Heat of the Sun disobstructs the Pores of the Surface of the Earth, and then the Plants receive from their Roots this Nitre, which feeds, foment and preserves them. *For without this Nitre there is no Vegetation on the Surface of the Earth, nor even in its profoundest Entrails.* Philosoph. Treat. lib. 2. Chap. 5.

8. The Learn'd of the Academy, *Curiosorum Naturæ*, in Germany ascribe to Nitre the monstrous Vegetations, and wonderful Superfétation, of which they never omit to take notice. Speaking of a Plant of *Bugloss*, that grew to a prodigious size, they impute the Cause of it to the Nitre, with which the Soil where it grew was extremely impregnated, by the great Snows that had fallen that Year. The Snows, say they, that fell in great Quantity, had by their nitrous Substance given to some Plants so uncommon a Fecundity, that they grew to be Monsters. Which may be confirm'd by the Secret of Multiplication, of which *Glauberus* is thought to be the Inventor, and which *Joan Ferdinandus Hertodius* has lately publish'd in his *Crocologia*, whereby a prodigious

ous Multiplication is imparted to Seeds, only by steeping them a little in a certain Liquor before they are sown. *Nives copiosissimas nitrosa sua Substantia sic plantas quasdam fecundasse, ut sic multiplicatae prodierint: quod forte confirmari possit artificio illo, quo quidam menstruo quodam secreto, cujus Inventor Gläuberus creditur, et quod Joan. Ferdinand. Hertodius in Crocologia sua communicavit, in quo semina non nihil macerata ita fecundari dicuntur, ut plantas multo lætiores & multiplicatiores promittant.* Miscellan. Curios. An. var. 1. 102. Obser.

Sendivogius holds that where the Sun beams beat most, there is most Nitre; and consequently a greater Crop of Corn. There is no doubt of it, says *Adolphus Balduinus*, because a Field is the more fruitful, the more 'tis warm'd by Stercorations; Dungs being full of Nitre. Thence *Albertus Magnus* found the Secret of having all sorts of Flowers, and Fruits on his Trees in Winter. *Observat. Curiosor. Natur. 1674.*

9. *Bacon* was one of the first who recommended the use of Nitre as a most proper Means to make Plants thrive, and to render them Fruitful. 'Tis said, says he, that Nitre mixt with Water to a Consistency of Honey, is excellent to hasten the Vines. If after the Vines are prun'd we moisten the Buds a little with it, they will shoot out Leaves in less than eight Days: the reason whereof is evident; because the Subtile Part of the Nitre, which is the Soul of all Vegetables, being apply'd to the Buds, penetrates and makes them oper. *Causa verisimilis in Spiritu Nitri, quod vegetabilium anima est, ingresso gemmam, partesque cor-*

tiguas, easque dum penetrat, aperiente. Syl. Cent. 5. n. 444. From hence too this great Naturalist was of Opinion, that if we laid Seaweed at the Foot of Cabbages, or of any other Plants, they would vegetate in a Surprizing manner; because the Salt contain'd in that Plant, has a wonderful Virtue to make others produce, and to awaken their Fertility. *Virtus ad Salem referenda, magno fertilitatis adjumento.* Syl. Cent. 5. n. 457.

In another place he advises to lay Salt, the Lees of Wine, or Dead Beasts, at the Foot of Trees; and assures, that they will bear more Fruit, which will be uncommonly large and beautiful. Syl. Cent. 5. n. 467.

He can not leave off when he talks of Nitre in regard to Plants. The Antients, says he, tell us, that if we water a Cabbage with Salt-Water, it will grow so fast that the Eye may perceive it, and will have a more delicious Taste. This Salt-Water ought to be made with a little Nitre, which is milder and not so burning as the common Salt: *Aqua cui nitrum admixtum; spiritu præ Sale minus adurente.* Sylv. Cent. 5. n. 460.

10. Sir Kenelm Digby in his *Discourse concerning the Vegetation of Plants*, surpasses all who have treated of this Point of Physicks. He has explain'd in a very intelligible manner the Mechanical Order that Nature observes in the Vegetation of Plants; and no Man has spoken more worthily than he of the Excellence of Nitre. He allows that the small Portion of Salt, which each Grain of Corn imbibes in its preparation, can never suffice for the Nourishment of so great a Plant, as a Tuft of Corn
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that contains a hundred Srems : but he regards these little nitrous corpuscles, assisted by those that are in the Earth, as a Load-stone that attracts the Nitre, which is diffus'd in the Air. Nitre, says he, is a Load-stone in it self, that continually draws from the Air a like Salt, that renders it fruitful and vivifying. Hence the *Cosmopolite* took occasion to say, that *there is in the Air an invisible and secret substance of Life. This sweet and Balsamick Salt contributes to the Life of Animals, and of Men, as well as to the Life of Plants.* 'Tis the true Nourishment of the Lungs and of the Spirits, and in it dwell the seminal Virtues of all things, For 'tis only a most pure and simple Extract, prepar'd from all the Bodies, on which the Sun darts down his fiercest Beams ; by sublimating it to such a height, that it acquires the last Degree of Purity. This terrestrial Load-stone, this creeping Lizard draws down to it, and sucks, as I may say, that flying Dragon, that they may incorporate with each other, and make together, but one whole, conformably to this great Aphorism of the *Table of Emerald* ; *The Superior and the Inferior make but one and the same Essence. The Sun is its Father, the Moon its Mother, the Earth its Nurse ; and the Air conveys and distributes it every where.* Seeing therefore this universal Spirit is homogenous to all things, and in its effects is the Spirit of Life, not only to Plants, but likewise to Animals ; is it not reasonable, and of the highest Importance, to prepare it duly, that it may be of no less service in healing the Diseases of human Bodies, than in restoring Plants to their primitive and verdant Vigour. *Albertus Magnus* was surnam'd, *Magus*, because

because even in the severest Colds of Winter, by the Means of this Spirit, or of this heavenly and balsamick Salt, he was ingenious enough to make all sorts of Plants germinate and bear Fruits in perfect Maturity. If we follow'd the Rules of this great Master, to render this Salt Sympathetical and agreeable to human bodies, *there is no manner of Doubt, but it would produce in us the same Effects, that it does in Plants.* p. 60, 61. This Opinion concerning the Nitre of the Air, that continually falls down and hovers about the Corn that is impregnated with the same Salt in its Preparation; is the Physical Operation of Nature herself. This reunion of the *Superior* and of the *Inferior*, is not a vain Imagination but a real and effective Truth. From this Marriage of Heaven and Earth are born all the Offsprings that are produc'd in the Race of Vegetables and in the Race of Animals. This Salt being exalted and put in Motion by the returning Warmth of the Spring, mixes it self with the Juice of Plants, and with the Blood of Animals, and excites both of them to the Multiplication of their Kinds. Thence proceeds this charming Renovation of Youth, this general Joy, which the Spring causes to brighten over the whole Face of Nature. And this very Nitre, duly prepar'd for the Use of Man, would repair from time to time the Ruins occasion'd by Length of Years, and procure us the Happiness of growing Young again, which the Holy Scripture it self acknowledges in the Eagle: *Renovabitur ut Aquilæ juvenitus tua*, Psalm 103. v. 3. *Victorinus Bythnerus* says, that the Eagle renews its Youth every tenth Year; that all its old Feathers drop off, and that young ones grow

grow in their Room; so that we would believe an old Eagle to be a young Eaglet. *Lyra Prophet.* p. 520.

11. *Dennis*, after having shewn that Water alone is not sufficient for the Nourishment of certain Plants, proves it by Experience. The Lands, says he, that are sown every Year, waste daily, and by Degrees grow leaner and leaner. And notwithstanding they are humected and water'd with Rain as usual, they are destitute of the Juices requir'd for the Nourishment of Plants. After having born Crops for five and six Years successively, we are oblig'd to lay them fallow for one; and to spread them over with Dung, Marle, or the Like, to fatten them again, and restore them to their former Fertility. Therefore, besides the Water that is in the Earth, there is a certain nitrous Salt, diffus'd in all its Pores, which being dissolv'd by the penetrating Parts of the Water, is rais'd up with them, to convey to Plants their Nourishment. This Opinion is not a bare Supposition, seeing the Chymists actually find some of this Salt, not only in Plants, but also in the Bosom of the Earth: and we see by Experience that Soils have no Fertility but proportionably as they abound with this Salt. Dung, for Example, is good to fatten a dry Soil, because the Urine and Excrements of Animals contain a great Deal of Nitre. 'Tis an excellent Receipt for the Multiplication of Corn, to lay it a soaking for some Time before we sow it, in a certain *Lixivium* of Salt-Water. Thus 'tis most true that this Salt is the chief Nourishment of Plants; the Water that dissolves it by Penetration, serves as a Vehicle to convey it up to the very Tops of the Branches.

12. No Man has no more Pretence to speak of Nitre, than M. Boyle; who by the Analysis he made of it in his Laboratory, discover'd better than any had done before him, the Nature and the Essence of that Salt. He study'd it with indefatigable Toil and Application: and seeing he speaks of it by his own Experience, we ought to give Ear to his Assertions. He begins by saying, that Nitre cannot be exactly follow'd by any Analysis can be made of it; because it conceals it self in many different Figures; that all Minerals, Plants, and Animals have a share of it; that no Bodies can subsist without it; that it makes a Part of the Composition of all mixt Bodies; and in a word, that there is not in all Nature *a more catholic Salt*; that is to say, a Salt more universally diffus'd through all the Elementary World: *Nullum salern esse qui sit Nitro magis catholicus. Tentamen Physico Chymic. circa Partes Nitri.* Sect. 1. This learned Naturalist assures us, that he found in the substance of this Salt, two sorts of Salts; 1. *a volatile Salt, which is acid.* 2. *a Fixt Salt, which is an Alkali.* Sect. 27. But what is yet more Curious in this long Analysis, made by Distillations, Dissolutions, Coagulations, Mixtures and Separations, is that Boyle often lost sight of the Nitre, which, like a Proteus, suddenly chang'd its Figure, so as not to be known again, even then when he held it bound in the Chains of his Chymical Operations. Another Wonder is, that this Salt, that had so often been lost, that had so often Disguis'd and Metamorphis'd it self, during the long and laborious Operation, was at last found again in the same Quantity as when Boyle first made use of it.

it. This is the Miracle: after having dissolv'd and separated its Parts, he restor'd it intire weight for Weight. Chymistry never went so far: The Artists indeed boast of separating mixt Bodies, and reducing them into all their Parts: but 'tis maintain'd against them, that many will escape their nicest Care; and this is undeniably prov'd by the Impossibility they lie under of restoring them to their first State, by reuniting the five Principles, which they drew from them. This is what they could never arrive to; but what *Boyle* has done. He separated the several Parts of the Nitre, and after having long handled them separately he reunited them, and restor'd that pretious Salt to its first Bulk and State. After this that Philosopher Declares, *that Nitre is a Being privileg'd by Nature*; that 'tis one of the most simple unmixt Bodies, and of a slight Contexture: and that no Consequence could be drawn from what he had done in Regard to that Salt, concerning other Bodies that are more mixt, and of a more intricate Contexture. Wine, says he, how simple and uncompounded a Body so ever it be, cannot be restor'd to his first State, by reuniting its Parts, when they are once separated. How much more difficult then is it to re-establish Bodies; that are compos'd of Organical Parts, as the Bodies of Animals? Such is their Make, that all the Wit of Man ought for ever to renounce the very Thoughts of restoring Life to an Animal, whose Symmetry Death has destroy'd. And we cannot enough wonder how such a Phrenzy could enter into the Brains of *Paracelsus*, who was otherwise so great a Man. All the Cunning of Mechanicks
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can never raise up Art to the same Level with Nature. 'Tis not then surprizing, adds *Boyle*, that we regard as a Fable what the Physiologists relate of the Phoenix, that it springs from its own Ashes. But there is a Prodigy, which tho' it come not near the pretended Resurrection of the Phoenix, deserves nevertheless our Attention. *Kircherus, Lib. 3. de Art. Magnet. cap. 5.* tells us, that not far from *Pelorus*, a Promontory of *Sicily*, and now call'd *Capo di Faro*, the Shells of Fish, that are reduc'd to Powder on the sides of the Lake, produce themselves again, if that Dust be water'd with Salt Water. *Boyle* is not forward to contradict this Relation; but he wishes that Author had only said that new Shells were form'd of that Powder. This Learned *Englishman* touches this Point very tenderly, and with much Politeness and good Breeding. And indeed great Men ought to be respected; and their little Oversights rather conceal'd than upbraided: especially of such as have labour'd as much as that famous Jesuit has done, to illustrate the History of Nature; which is one of the most noble Parts of Philosophy. When we hate not the Person, and seek only after Truth, the Dispute has no Warmth that is offensive.

13. *Libanius* ascribes the Fertility of *Egypt* to the Nitre, which the *Nile*, when it overflows, carries on the Lands it lays under Water. *Strabo* says, that beyond *Momemphis*, there are two Mines of Nitre, which are so abundant, that they give that Country its Name. *Ultra Momemphim sunt Nitrariae duae, quae Nitrum plurimum ferunt; unde Nitrioica Praefectura est. Geograph. lib. 17.* 'Tis certain there

there is a great Quantity of Nitre in all the Country of *Egypt*; and not long along ago a great Deal was brought from thence to *Paris*. The Use of it is now forbidden in *France*. When the *Nile* overflows, it conveys its nitrous Salt upon the Lands, and imparts to them an extraordinary Fertility. There can be no better Proof of the Riches that Nature bestows on that Country, than the immense Tribute it pay'd to *Ptolemy Auletes*, Father of the famous *Cleopatra*. *Strabo*, after *Cicero*, says, that it amounted to the Sum of twelve thousand five hundred Talents. This *Auletes* Play'd on the Flute, minded only his Pleasures, and was extremely neglectful of the Affairs of Government: which made *Strabo* say; If so lazy a King, and so unworthy an administrator of the Kingdom, had so great a Revenue; how much more ought *Egypt* now to be worth, under the Government of the *Romans*, who are so industrious in the Culture of their Lands? *Geograph. Lib. 17.* This Fertility is easily seen by the great Number of the Towns and Villages of *Egypt*. Under their King *Amasis*, there was twenty Thousand Towns. And how populous soever the Kingdom was then, 'twas much better peopled under the *Ptolemys*, says *Marsham*. *Et sub Ptolemeis tandem maximum cepit Ægyptus incrementum. Chronic. Ægypt, Sæcul. 15.* Thus too *Josephus* says, that in his Days there was in *Egypt*, seven Millions five hundred thousand Men, without counting those that were in the City of *Alexandria*. *Bel-lum, Judaic. lib. 2. cap. 16.* And what increases the Wonder is this; that *Egypt* where it is most inha-

inhabited, is scarce above one hundred and fifty Leagues long, and fifty broad.

Seneca says, that the Fruitfulness of the Women of *Egypt* proceeds from their Drinking the Water of the *Nile*. There are, says he, several things for which no reason can be given: for example; why the Water of the *Nile* renders Women so fruitful, that if a barren Woman but drink of it, she soon becomes as Mother? *Quorundam causa non potest reddi; quare aquo Nilatica fecundiores feminas faciat; adeo ut quarundam viscera longa sterilitate præclusa, ad conceptum relaxaverit.* *Nat. Quæst. Lib. 3. Cap. 25.*

Pliny says, that the *Nile* gives alike Fertility to the Earth, and Fruitfulness to Women. *Fertifer potu Nilus.* *Hist. Nat. Lib. 8. cap. 3.* And a little after he adds, that 'tis not extraordinary in *Egypt* for a Woman to have seven Children at a Birth. *Et in Ægypto septenos uno utero simul gigni, ætor est Trogus.*

Wendelinus is of Opinion, that the Hebrew Women, during their stay in *Egypt*, got by Drinking the Waters of the *Nile*, that wonderful Fruitfulness, which produc'd in short times so numerous a People. In *Genesis*, Chap. 46. v. 27. 'tis said, that all the Persons of the House of *Jacob*, who came into *Egypt*, were threescore and ten. *Moses* declares in *Exodus*, Chap. 1. v. 7. that the Children of *Israel* increas'd and multiply'd exceedingly. And in Chap. 12. v. 37. he adds, that they went out about six hundred thousand Men on Foot, besides the Children. This prodigious and astonishing Multiplication was effected in the space of two hundred and fifteen Years. *Wendelin. Admirand. Nili. cap. 24.*

Libavius

Libavius pretends, that the Waters of the Nile impart this Fertility to the Earth, and this Pecundity to Women, only because they contain some Nitrous Corpuscles. *Aqua Niloticæ ad Generationem & Nutritionem ideo aptæ sunt, quod sint nitrosæ.* Part. 4. Singul. lib. de ferin. Tuberan. Cap. 12.

Theophrastus alledges no other Reason why the Water of the Nile makes the Animals of Egypt so Fruitful, but because 'tis Nitrous. And therefore *Pliny* calls it, a Water that favours Generation; and the Nile itself the Husbandman of Egypt. *Genitalis aqua.* Hist. Nat. lib. 9. Cap. 58. But whatever *Pliny* says, the Egyptians had another Opinion of it. They made a God of their Nilus, and consecrated to him Festival Days, which they celebrated by Games, Spectacles, Feasts, and even by Sacrifices. *Heliodor.* lib. 9. & 10.

All the Prosperity of Egypt depended on the overflowing of this River, and therefore the Egyptians observ'd it with much attention. *Pliny* says, that when the Nile encreas'd but twelve or thirteen Cubits, there was a Famine in Egypt, because the Hillocks and rising Grounds could not then be cover'd with its Waters, nor impregnated with its Nitrous Salts. Fourteen Cubits diffus'd the Waters and Gladness in all Places. Fifteen Cubits gave certain Bodings of a plenteous Harvest; but sixteen Cubits were celebrated with Publick Feasts and Rejoicings. *In duodecim Cubitis famem sentit: in tredecim etiamnum esurit: quatuordecim cubita hilaritatem asserunt: quindecim, securitatem: sexdecim, delicias.* Hist. Nat. lib. 5. cap. 9. When the Waters rose to be more than sixteen

teen Cubits, it put them into a Fright, lest it should be so long before it retir'd, and the Earth grew dry, that the Seed-Season wou'd first be over. They dreaded alike, a little and a great Inundation. Sixteen Cubits were exactly what was requisite. *Iustum incrementum est cubitorum sexdecim: Minores aquæ non omnia rigant: ampliores detinent, tardius recedendo. Hæ serendi tempus absumunt; solo madente: ille non dant, sitiente. Utrumque reputat Provincia.*

Strabo says, that at the end of sixty days, the Nile is intirely retreated within its Channel, and that the Lands are again uncover'd.

It has been observ'd, that the Nile generally begins to swell the 17th of June, and never much sooner, nor much later. The Egyptians compute the Height to which the Nile rises by a Vessel which they call a Niloscope, or Nilometer. 'Tis a sort of Well, dug in the Earth; and whose Bottom has a Communication with the Nile, by the means of a Pipe. This hollow Cylindre is divided into parallel Circles at equal distances, from the bottom to the top. As the Nile increases, the Water rises in this Machine; and they compute the Height of its Inundation by the number of the Circles to which it rises, and thereby presage the Sterility or Fertility of the Year. *Strabon. Geograph. Lib. 4.*

There is now a publick Nilometer, built in an Island of the Nile, over against Cairo. 'Tis a square Well, eighteen Cubits deep, in the midst whereof is a Column of Marble, divided into Cubits: By this Column they know the increase of the Nile, and accordingly ground their Fears and Hopes for the following Harvest. *Marin. Sanut. Lib. 3. Cap. 12.*

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An Inundation of sixteen Cubits being the Object of the Wishes of all the Country ; whenever it happens, the People forget nothing to testify their Joy, for the Hopes they have of a plentiful Harvest. Heretofore they erected Publick Monuments in Memory of such a Flood. And as Subjects sometimes love to flatter their Sovereigns and to ascribe to them the Merit of a good Action, in which they had not any thing to do ; the *Egyptians* congratulated and return'd thanks to their Princes, when the Overflowing of the *Nile* rise to sixteen Cubits ; as if they had actually been the Cause of it. This we see by a Brass Medal, struck in *Egypt*, in Honour of the Emperor *Adrianus*. On the Reverse of this Medal, we have the Figure of a Man lying a long, holding in his Left Hand a Reed, and in his Right a Horn of Plenty. This Man represents the *Nile*, which by its Inundation diffuses Plenty thro' all the Country of *Egypt*. There is beside him a Crocodile, because that Animals is generally are found on the Banks of that River. The *Iota*, and the *ινισαμιν*, that are at the top of the Medal, signify the number of sixteen, according to the numeral Letters of the *Greeks*. All which teaches us, that in the Year when the Emperor *Adrianus* was in *Egypt*, where he lost his Favourite *Antinous*, that River overflow'd to the height of sixteen Cubits. The *Egyptians* return'd thanks for it to that Prince by Medals struck on purpose, as if his Presence had contributed to this due Inundation.

SOME object against us, that Salt, far from Fertilizing the Earth, is taken in the Holy Scripture for a proof of Sterility. In *Psalm 107. v. 34.* 'tis said, that *God turns a Fruitful Land into Saltness, for the Wickedness of the Inhabitants that dwell therein.* For the same Reason, it was that *Abimelech* having taken the Town of *Shechem*, and slain all the Inhabitants, raz'd the City, and sow'd the Ground where it stood with Salt. *Judges, Chap. 9. v. 45.* *Attila* did the like at *Padua*, and the Emperor *Frederick Barbarossa* at *Milan.*

ANSWER.

DE la *Chambre* in his excellent Discourse, concerning the Causes of the Overflowing of the *Nile*, answers this Objection much better than I could have done. As to the Objection, says he, that is made concerning Sterility, we might answer, that all sorts of Salt are not proper to enrich the Ground: That Nitre only has that Virtue; and that all the other Salts burn and parch it up. But to speak the Truth, all Salts may render it Fertile, provided they be duly prepar'd for it. For if they are not well mingled with the Earth, and dissolv'd, they produce nothing. Even Nitre itself, which is the most Fruitful of them all, is of no service to Plants, unless it be incorporated with the Earth, and in a condition to flow, and rise up into their Leaves and Branches. And this is the Reason, that the Soil of *Egypt*, which the

Nile

Nitre cannot overflow, continues barren; the *Nitre*, of which it is full, not being dissolv'd. And no doubt, the *Prophet* meant to speak of a Soil of this Nature, when he oppos'd it to a Fruitful Land. For 'tis likely, that in Writing this, he might call to Mind the Land of *Egypt*, the Desarts of *Arabia*, and the Neighbourhood of the Lake *Asphaltites*; which tho' they abound in Salt, are barren, because that Salt is not melted by fresh Waters; and by consequence is incapable of mounting. We may assert the same thing too of common Salt; for tho' it be heavier than the other, it has nevertheless some Volatile Parts, that may serve to the Production of Plants. And indeed they have not been able to find, in the Kingdom of *Valencia*, any better method to make their Olive-Trees bear plenty of Fruit, than by throwing Sea-water on their Roots: Which Practice is likewise made use of in *Peru* for their Palm-trees. And 'tis observ'd that the most Fertile Soils are those that lie next the Sea. For this reason the *Greeks* gave *Neptune* the Epithet of *φυσάλμης*, *Nourisher of Plants*. In short, this Truth would no longer be doubted, if men knew how fruitful the Lands are in the Salt Marshes of *Xaintonge*. For the filth that is taken from the Canals where the Salt is made, which is as Salt as the Sea-Water, bears Corn in greater Quantity, and Fruits of all Kind, as fair and delicious, as any other Soil whatsoever.

In Answer therefore to the Objection propos'd, we must positively affirm, that they who sow'd Salt to make the Earth barren, were grossly mistaken, and ignorant of the natural Qualities of Salt. Nay, 'tis likely that they

who commanded Salt to be Sown where stood before the Towns which they had raz'd, did not so to render the Ground barren; seeing in the Condition to which the Ruins had reduc'd it, it was not fit to be cultivated. But 'twas rather a mysterious Punishment, to let the World see, that the Towns they thus punish'd had wanted Prudence, of which Salt is the Hieroglyphick. After all we may say, that tho' Salt make the Earth fruitful, there must nevertheless be a due Proportion of it, and that if there be too much, it parches and dries up the Earth, and so may make it barren. *Discours sur le Debordem. du Nil, Part. 1. Artic. 12.*

CHAP. IX.

A new Way of easily propagating Plants and Trees. And how far this Method tends to the Perfection of Gardening.

Hitherto all the Industry of Men for the Multiplication of Plants has arriv'd no farther than to propagate them from Seeds, from Roots, from Layers, from Suckers, from Slips, and from Grafts: And all these ways are tedious, troublesome, and sometimes uncertain: especially in regard to many Trees, that cannot be increas'd without a World of Care and labour. The Layers, which seems to be the safest and best way to have Fruit very soon, will not

not succeed on all sorts of Trees. *De la Quintinie* complains heartily of it. I very much wish, says he, it were as easy to make Roots the same way in other Trees, as it is in setting the Branches of Vines, Fig-trees, Quince-Trees, Gooseberry-Trees, Mirtle, and some others: For the Advantages that would thence accrue would be vast, and in a manner infinite. Reflect. upon Agriculture. Chap. 2. Thus we see that the most knowing and experienc'd Gardiner that ever liv'd, freely owns that the Method of Multiplying Plants by Layers is subject to many great Inconveniencies, and which cannot be got over in regard to some Trees. 'Tis therefore to be wish'd we had some better Method.

There are some Trees, especially the exotick; whose Kinds 'tis not possible to propagate, by any of the ways, practis'd in Gardening. It looks as if these Trees were vex'd at their being in a Strange Country, and laid their Misfortune so much to heart, that they cannot be brought to leave any Posterity behind them. Of this take the following Example. In the Year 1660, One *Ankelman*, a Merchant of *Hamburg*, bought in *Holland* a Cinnamon-Tree, that had been brought from the *West-Indies*. 'Twas then but three Foot high, and about two Inches in Girth. 'Tis now sixteen Foot high, Case and all, and bigger than any man's Arm. It shoots out Flowers every Year towards the End of *August*. As for Fruit, it bears none but its Bark, which Slips itself off every Year. The Owner of the Tree values it so much, that he has refus'd two thousand Crowns for it, which were offer'd him by the

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Elector of *Brandenburg*. *Ankelman* thought to have had some of the Race of it, and then he would have parted with it: but all the Expedients he could think to make use of were to no manner of purpose. Notice has since been given the Publick, that this was not the right Cinnamon-tree, but the *Persea*, describ'd in 1661. in the Physick Garden of *Amsterdam*. It appears by the Description given of it, that 'twas impossible to make it provine.

Not less is the Difficulty to multiply Plants and Trees by their Seeds and Stones. We meet with Delays that vex us to the very Soul: and that too the rather because all of us are desirous to reap the Fruits of ur own Labours. In Gardening we are often cross'd with the like Mortifications: I would fain know, says *De la Quintinie*, whence it sometimes happens, that certain Trees newly planted remain a long time in the Earth, some two or three Months, nay, as many Years, without any the least Appearance of Action: as also how some Seeds continue whole Years without Sprouting. *Reflections up. Agricult. chap. 6.* We cannot, but at the Expende of Time and Trouble arrive at the Multiplication of Plants, Fruits and Trees, by their Seeds, their Kernels, their Suckers, or by their Grafts. In regard to Slips likewise the time is tedious and the Event doubtful. *The Retir'd Gardiner*, who finds the Method of Multiplying Trees by Slips, to be very easy in regard to Fig-Trees, owns that these Slips can not be rais'd under some Years time; and requires besides a great Deal of Care and Ceremony. You must, says he, dig a Trench about a foot deep, and near a Foot-broad, fill it full of Fat rotten

rotten Dung, and plant the Slips after the same manner you plant Vines, that is, a little crook'd, taking care to water them when 'tis necessary. They will take Root, and in some few Years be in a Condition to be transplanted. Chap. 11. See here a deal of Care and Time, even in regard to Fig-trees, which nevertheless take Root the soonest of any. What Toils must we then undergo about other Trees, which are very difficult to propagate even by their Layers? Tho' we be ever so industrious and careful, it will require several Years to raise them.

We shall therefore lay no small obligation on the Publick, if we communicate to them a secret, to make all sorts of Branches of Trees take Root very easily, and never fail of Success: as also how to make all Seeds and Kernels of Fruits do the like. M. *Lignon* has found out a Secret to make the Branches of Trees take Root in a short time, and to bear Flowers and Fruits in less than two years: and to him I am beholden for the Discovery. Some have bethought themselves as well as he, to put Branches into Vials of Water, to see what would be the Result of it, and whether they could nourish themselves with nothing but Water. It sometimes happen'd that they did shoot out Roots; which gave occasion to the Naturalists to enquire, whether Water alone were a sufficient Nourishment for Plants. They stopt here; but M. *Lignon* has gone farther. He would not confine his Studies meerly to Philosophical Contemplations; but turn'd his Discoveries towards the Affair of Gardening, that he might make them useful to the

Publick Good. This is what he has done by disposing these little Infant Trees to pass from their watry Nourishment in the Vial, to that which Nature prepares for them in the Earth; wherein he has succeeded to Admiration. As to what relates to the Germination of Seeds and Kernels by the Means of Water, I am oblig'd to the Physick Experiments that *Ghiarreschini* has made, it having luckily come into my Head to apply them to the Culture of Gardens. We will begin by the Method, we have had from *M. Lignon*, who is so well known by his Voyages to *Guadeloupe* from whence he has brought in Quality of the King's Botanist, a great Number of Plants that grow in the Earth, and in the Sea; and which have fully justify'd the Opinion, that the World had already conceiv'd of his Judgment, and of his Knowledge in the Affair of Exotick Plants. We can not do better than to insert in this Place a Letter, in which he gives an Account of the Method he observ'd in order to reduce into Rule this new way of propagating Plants.

A Letter written from Paris the First of January, 1705. by Mr. Lignon the Younger, to Mr. Auger Governor of Guadeloupa and other Islands. Concerning a new Manner of easily propagating all sorts of Plants and Exotick Trees.

SIR,

SEeing you are so well vers'd in the Knowledge of Plants, and take great Pleasure in cultivating them sometimes with your own Hands, in your most delicious and curious Garden, I hope you will not take it amiss, that I do my self the Honour to impart to you a small Discovery which I made the last time I travers'd over the *West-Indies*. I am flatter'd by my Friends that I have carry'd my Reflections farther than any of our Modern Naturalists. For tho' some of them have had a Glimpse of this new Method, which I practise, to make all sorts of Branches of Trees take Root easily, and in a little time; I am assur'd it never yet came into any of their Thoughts, to apply this Secret to the Use and Perfection of Gardening; to which, I dare promise, it will conduce not a little, when the Curious come to have the Knowledge of it. 'Tis no more but this;

The last time I went thro' the *West-Indies*, whither I had the Honour to be sent by the King in 1698. to bring into *France* the most extraordinary Plants I could meet with: I imagin'd with my self, in pursuance of some Experiments which I had made at *Guadeloupa*,
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that without the Help of Bell-Glasses and Hot-Beds, we might multiply in *Europe*, the very same curious Plants, that I brought over for his Majesty Three years ago, I resolv'd to make Trial of what I had had so long in my Mind. The Subject I chose for my first Essay, was the Dwarf Pome-granate-Tree, which was carry'd in the Year 1695. from the Coast of *Brasil* to *Guadeloupa*, from whence I since brought it into *France*. I must confess, Sir, that several private Affairs prevented me from following my Experiments to close as I ought to have done, to come to any certain Conclusion in the Affair: and 'twas not till the 20th of *March* 1703. that I set about the work in earnest; fully resolv'd to allow my self time enough to be certain whether I could make any thing of it or not, I took the end of a Branch of a small *Indian* Pome-granate-tree; which was as big as a Goose-Quill. I put it into a Glass Vial, with River-Water, and expos'd it to the South-Sun in a Window at the Top of my House. I chang'd the water twice or thrice a Week. I could not perceive for some Days that any thing new had happen'd to my little Branch. When the Sun began to grow warmer, I chang'd the Water every Day: Because I fancy'd at least that the oftener I renew'd the Water, the little Branch look'd more healthy and lively. 'Tis true there happen'd some cold Weather, which retarded the Vegetation, I so impatiently expected; and from thence I concluded that we should not be too forward to try this Experiment till the weather be settled to be mild; that we may not give ourselves a Trouble to no purpose. But at length my Joy was

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compleat about six Weeks afterwards: for I perceiv'd towards the lower End of the Branch that Soak'd in the Water, a white Point, about two Lines long, and as big as a Pin, which prov'd to be a small tender Root.

I then thought it proper to give a more succulent Nourishment to this Infant Plant; so I took a little rich Earth, crumbled it in my Fingers, and sprinkled it in the Water. The next Morning I observ'd that the Root was grown as big again. I pour'd in Water very gently, that I might not wash off the Earth that stuck around the little Root; and thus I gave it fresh Water, adding likewise a little Earth, reduc'd as before to a very fine Powder, and letting it fall around my little Tree, that it might cleave to the Foot of it. And indeed, when the Water was grown clear, I found that this Earth cover'd the young Root, and the Foot of my little Plant. Three days afterwards, I discover'd a second Root below the first: then I assur'd myself that I had found the Way to make the slips of Exotick Plants take Root, without the Help of Bells-Glasses or Hot-Beds.

I was careful to nourish this second Root, as I had done the first: and I manag'd Matters so well, that in ten or twelve Days my new Roots vegetated considerably. Even the Top of the Branch continu'd not in a state of Idleness; but grew bristled with many little Points, that were as many Buttons, ready to shoot out Leaves. Thus I had a little Tree in all its Forms.

The next thing to be done, was to wean it from this too slender Nourishment, and give it a more substantial Food: for I am fully convinc'd that all sorts of Trees find not nourishment

ment enough in Water; and that Fruit-trees especially, besides the little Nitre that the Water contains, require the Salts and nourishing Juices of the Earth, to enable them to blossom and bear Fruit. In a Word, 'twas time to transplant my little Tree from the Element of Fish into the Element of Plants, which is the Earth. And here I apprehended very much to split upon some Rock: but there was no Remedy: it must be delay'd no longer, and therefore I set about it in this Manner.

I fill'd a little Pot with good Earth; I drew my little Tree out of the Vial: its Roots being wrapt up in the Earth, that had gather'd about them; in this Condition I put it gently into the Pot, covering its Roots by little and little. I omitted not to moisten the Earth very well. And that my little Plant might not change Elements all of a suddain, I fill'd a Dish with Water, in which I set the bottom of the little Pot, that the Roots might find the same sort of Nourishment, which had given them Birth.

'Twould be needless to observe that during some Days after this Transplantation, I took Care not to expose my little Tree to the cool Air of the Night, nor to the too great Heat of the Sun in the Day. In a short time I fancy'd that it began to find that Water agree'd not so well with it as Earth; and that 'twas not pleas'd with the Water, in which stood the bottom of the Pot below its Roots. It shot out indeed little Branches, but of a Pale Green: and there was not the least Sign of that Vermilion, with which new Shoots usually are cloath'd. Mistrusting what it ail'd, I took the Pot out of the Water, and began to treat my
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little Pome-granate-tree like an adult Plant, newly come out of its Infancy: and all succeeded to a Miracle. All the Summer long it was adorn'd with Leaves of a beautiful Green and Vermilion Colour. In Winter I took the same Care of it that we usually do of our Orange-trees, and many other Plants, which cannot indure the biting Blasts and Frosts of that Season, which deforms the whole Face of Nature. It lost its Leaves about the End of Autumn; but shot out new in the Beginning of the Spring. 'Twas cover'd like a little Forest in the Month of *May*, 1704, when I made a Present of it to the Abbot *de Vallemont*: who that very Year, had the Satisfaction to see it produce a Beautiful Flower, of the finest Carnation Colour that ever was seen. Thus you have the History of this new Way of Multiplying foreign Plants.

You may imagine, Sir, I was not Idle the next Year; when, the Summer being very warm, I try'd my Experiments on several Plants of Different Kinds. I confin'd not myself to the Plants useful to Life; but ventur'd on those that are merely curious. The famous *Sensitiva* Plant, which is so difficult to raise, is multiply'd with great Success by the Help of my Vials. I made several Branches take Root, and not one of them fail'd. A Friend of mine, kept all the Summer one of these Branches, which was grown to be a very Jolly Plant. Several Persons of Consideration can testify that I have multiply'd this Summer several other sorts of Foreign Plants: and some of them have now actually by them, some *Granadils*, or Passion-Flowers, that came likewise from Branches

ches that took Root in Water. I cannot forget to acquaint you, that one of my little Pome-granate-trees three Months after its Birth, by means of this Hydraulical Vegetation, bore me four charming Flowers. Hence we see what Art can do; and how easy it will be for the future to multiply all curious Trees. However I have not neglected the common Method; but have try'd how it would succeed on the same Plants. I lay'd in the Ground several Branches of different Trees: but all my Care was to no purpose: not one of them would take Root, whatever Diligence I imploy'd to make them. I spar'd neither for Bell-Glasses, nor for Hot-Beds; but all was in vain: for not one of them gave the least Token of Life. 'Tis indeed true, that we seldom fail of Success, when we go to work by the Way of Layers; but what an endless labour is it? 'Tis difficult to bow the Branches, and lay them in the Ground: and when we have done it, we must take Care to water them; to keep them from the excessive Heats of the Sun, and from the chilling Colds of the Night. It requires whole Years to raise up these Layers: whereas by my Method our Trees will blow sometimes at three Months End. Whoever reflects on this, will certainly not deny, but that let us go to work which way we can to multiply Plants, the Vegetation by water only, is beyond all Dispute the most curious, most easy, and most certain. I have observ'd in my Travels that the Savages of *Domingo*, when they transport Plants in their *Pyrags* from one Island to another, never fail before they Plant them, to lay them three or four Days in Water, to re-open
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their Pores, which might have been dry'd and clos'd up during their Transportation. And thus they prepare them to receive the nourishing Juices of the Earth. The Inhabitants of *Gnadaloupa* observe the like Method: And by this little care they are arriv'd to have Trees growing among them, that come from all the Parts of the World: of which I was an Eye-witness when I was there.

I forbear to mention several little Circumstances relating to this new Method of Vegetation; which, tho' of small Moment, will agreeably surprize all such as will put in Practise this new way of multiplying Plants and Trees. For my own Part, I should think my self very happy if this Curiosity shou'd prove to be of any Use to the Publick; and a Means to increase or facilitate the useful and Innocent Pleasures of Gardening. *I am, &c.*

OBSERVATION.

Several Advantages of this new Method of propagating Plants and Trees.

1. **N**ature seems to have all along affected a reserv'd Obscurity in her Productions, as if she had a Mind that the Way she takes in the Formation of Minerals, Plants and Animals, should be conceal'd from Men: as if they ought to rest satisfy'd with what she gives them of her own accord; and never have Recourse to the Helps that Art may afford them. For this Reason the Philosophers scrupled not to call the Places destin'd for the Propagation of the three Races of the Elementary World,

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the impenetrable Sanctuary of Nature. Abditæ naturæ recessus: naturæ Sacrarium, &c.

But by our new Method of propagating Plants, we have the Pleasure of plainly beholding the Works of Nature. The earnest Desire she has, not to remain barren, and without Action, makes her betray her own Secrets. 'Tis certain that Curiosity largely finds its Account in this Vegetation by Water only. There we consider at leisure the infinite Wisdom of God, who has made Laws and Rules, which Nature never violates. At first there appears a little Root: the Leaves come not till afterwards. These springing Leaves require Nourishment to support them: Nature therefore begins by forming the Organs that are to convey to them the nourishing Juices. The Sight of this little Spectacle, which is contain'd in a Vial, soon raises up the Mind towards the Supream Being, who has laid for the Foundation of all this wonderful OEconomy; a Matter void of Sense, and incapable in itself of any the least Motion. St. Anthony who chose the Works of Nature for the Subject of his devout Contemplations, certainly made a most judicious Choice, nor could he elsewhere have found so many Motives to excite him to bless and Praise the Creator.

II. By this new Method we give to a Tree of a good Kind, a numerous Posterity in a short Space of Time; by taking only some Ends of the Branches, which we put into a Vial, and set them in a Place pretty much expos'd to the Sun; whose Heat the Humidity of the Water indispensably requires. For which Reason the Philosophers call that Planet

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the true Fire of Nature, whose Absence in the Winter is the Cause that the volatile and Balsamick Salt, which is the Aliment of Plants, becomes so fixt by the Cold, that it cannot ferment and put itself in Motion. Hence proceeds the Dismal Lethargy that seizes all Nature in this ghastly Season. Heat animates Bodies, and Cold kills them, or at least suspends all the Functions of Life. *Sol variat circuitu suo quæ terra nascuntur*, says Plato, *Cratyl. lib. 23.* He gives life to whatever is born of the Earth. 'Tis he, says *Levinus Lemnius*, that makes the Seeds germinate, and that ripens the Fruits of the Earth. *Solis opera propagantur sata, ac fruges maturescunt. De occult. Nat. Miracul. Lib. 2. cap. 41.* We must not forget to change the Water in the Vial every Day: when the Nitre is exhausted, fresh Water is necessary: for Nitre is the main Agent in the Germination and in the Propagation of Plants.

When I advise to renew the Water often, I follow the Directions of the Learned, who have experimented the Vegetation by Water only. The famous Chymist *Adolphus Balduinus*, to whom we are beholden for many rare Curiosities, that we find in the Collection *Curiosorum Naturæ*, earnestly recommends this frequent renewing of the Water. *Sed aqua sæpe renovanda est.* Had he reflected of how great Utility these Experiments might be to Gardening, he would have left us nothing to wish at his hands: for we may truly affirm that he has brought this new Culture of Plants to great Perfection. He promises himself Wonders from it: but let us hear his own Words; for

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the Style of Chymists is inimitably bright and shining. It must be confess'd, *says he*, that *Fabri* philosophizes with much solidity, when he asserts, that with Water and with the Heat of the Sun, we may nourish, cause to vegetate, and to bear Flowers all sorts of Plants in Glass Vials: that we may make the Exotick Plants sprout there, and produce Flowers and Fruits four times a year, provided we protect them from the Insults of the Cold: nay, that we may even resuscitate dead Plants. There are some who doubt this to be true, but I make no question of it. Last Year I made an Experiment, after *Borellus*, which gave me much Satisfaction. I had never believ'd that Plants could nourish themselves with Water only, nor would I yet give credit to it, but that I know by an Experience of Six Months together, that some little Slips of Basil, being put into Glass Vials fill'd with Water, sprouted out Roots and Leaves, and even bore Flowers. Besides the Heat of the Sun, great Care must be taken often to renew the Water: *Sed aqua renovanda saepe est*: which makes me believe that Water and the Irradiations of the Sun suffice for the Nourishment of Plants. *Quare credendum est ab aere & aqua nutrimentum capere.* The learned *Libavius* makes mention of a Plant, whose Seed germinated under Water in a Glass Vial; and of a Tulip that came from a Bulb, that was put likewise into Water. But let us hear what a French Author [*Planis-Campy*] says in his *little Chirurgery*, chap. 21. If I live till next Year my Closet will become a Garden. I am preparing a great Number of Glass Vials, in which I will have

have all the Year round, Violets, Roses, Narcissus's, Tulips, Gilliflowers, and all sorts of other Flowers, which I design to render immortal. Salt being the Balm of Water, without which it would not keep, nor be able to nourish Plants; I will prepare this Salt and this Water in such a Manner as shall give Immortality to my Flowers. No mortal Eye ever beheld what I will do; and no man living can do it, unless he have read *my immortal Flora: nisi Flora nostra inspecta semper viva.* Miscellan. Curiosor. nat. 1674. de Virtutib. Auri. cap. 12. This is promising a great Deal: and some part of it may be true, but I dare not answer for all.

'Tis safer to rely on *Ghiarefchius*; because he advances nothing but what he has perform'd. All the Experiments he made, related to the Germination of Seeds: which is an Affair not to be despis'd. Every one ought chiefly to study some particuar thing, which is the only way to perfect natural Philosophy. Now *Ghiarefchius* has discover'd a new way to raise them, which will be of great Advantage in regard to Exotick Seeds. We need not cumber ourselves with Hot-Beds and Bell Glasses. We shall make quicker Dispatch by the Germination in Vials, as may be seen by his Experiments. I was not ignorant, says *Ghiarefchius*, that there are some Plants, which have no Communication with the Earth; and I knew besides, that these Plants, which are Withwind, Mistletoe, Ivy, &c. nourish themselves from Trees, that draw their Aliment from the Earth. But I know more at present, that Plants may be rais'd

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from Seed, and borrow nothing from the Earth, either by themselves, or by the Mediation of any other Plants. The Experiments I my self have made, have convinc'd me of it. I begun by the imperfect Plants, as Mushrooms. I put at the bottom of a Vessel the Ozier that flask'd a Glass Bottle. Upon it I laid some little bits of Mushrooms without any Earth. I water'd the whole with a little lukewarm Water. In twelve Days there grew some young Mushrooms upon this Ozier: their Stalks were as big as a Gooses Quill; and they continu'd to vegetate very well to my great Satisfaction.

After this Success I try'd other Experiments that are not less curious. I put into the same Vessel, and upon the same Ozier, Beans, Pease, Wheat, Rye, the Seeds of Cucumbers, Melons, Fennil, &c. In a little short time they all began to germinate without any trouble; some indeed sooner than the rest: but at length none of them could resist the soft Caresses of the Humidity join'd with the Heat of the Sun. The Fennel and the Millor grew not to above two Inches high: but all the rest to twice or thrice that Growth; which bounded the Space of their Duration; for then these tender Plants wither'd and dy'd away. I took from thence only the Chich Pease, and transplanted them in a Pot fill'd with Earth, where they blossom'd and grew up to Seed with all the Success imaginable.

Among other things I observ'd that two Beans, each of which weigh'd ten Grains before I put them into the Place where they were

to germinate, weigh'd seventy two Grains each, after they had sprouted out: which Increase can be imputed to nothing but the common Water, since they had not the least Communication with the Earth. The Experiment that *Val Helmont* made on a Branch of Sallow, and *Boyle* on an *Indian Melon*, which these two Virtuoso's had made to vegetate in an Earth which they only water'd, having first weigh'd it, and finding afterwards the same Weight, does not so fully demonstrate that Water alone will suffice for the Growth of Plants: for we may reasonably suspect that some small Emanations of Saline and Earthly Corpuscles had a share in their Experiments.

The more success I found in my Attempts, the more eager I was to pursue them; and my Imagination growing warm, continually suggested to me some more ingenious ways to discover how far Nature could go in the Vegetation of Plants, by the Help of Water only. I bethought my self to put some dry Saw-dust at the bottom of my Vessel: Because that Powder of Wood is more proper to preserve the Humidity longer, and to give leave to the new born Roots to work themselves easily in it. Besides I no longer made use of common Water, but of some in which I had dissolv'd several Salts. I soon perceiv'd that all my little Cares succeeded. I observ'd some Degree of strength in my young Plants, which were adorn'd with a lively and vigorous Green; a Symptom I had not seen in my former Essays. Three Beans especially grew to be a Foot and half high; they had beautiful Leaves and

Branches,

Branches, and were in Blossom a Month together: So that had not the cold Nights surpriz'd them, I doubt not but I should have eaten young Beans in the Month of *November*. So far *Ghiarefchius*; whose Observations, tho' of Moment, are not tedious. The Curiosities of Physicks are Amusements, were there no more in them. But certainly this discovers to us the Secrets of Nature, who for several thousands of Ages suffer'd us to believe, that Plants could not come up and nourish themselves, except in the Earth; and we know now perfectly well, that in the Place of this universal Mother of Vegetables, we may Substitute Water as an excellent Nurse to whom we may safely trust the Birth and bringing up of the Plants, at least to a certain Age: for after all it must be allow'd, that Earth claims her Children, when they are past their Infancy, that she may take them from the Use of only Water and Salt, as from too austere and sparing a Diet, and regale them with the delicious and substantial Aliment of her own nourishing Juices. After all this is an infallible Secret for a speedy Germination of the Seeds and Fruits of foreign Countries, which with so much difficulty are brought to germinate by the Method of Hot-Beds, and Bell-Glasses. Besides the advantages that will from hence accrue to Gardening, nothing can be more diverting than these little Experiments. 'Twill not cost a Shilling to divert our selves with them a whole Summer long. There is no need of studying whole Volumes of Philosophers, to pursue these innocent Delights: concerning which all Men are

are on the same Level. These little Sports of Nature are within the Capacity of all the World: every one may participate of them, and make himself a Garden without Earth, at his Chamber-Windows:

III. A third Advantage of this Method is, that we may have in our own Country Plantations of these Exotick Plants, which we have hitherto regarded only as the Ornaments of the Closets of the Curious, and as the Objects of the Commerce of Merchants. What an Advantage would it be to the Nation, if we could make those Plants grow among us, whose Barks, Gums, Woods, Leaves and Roots we buy so dear, and for which we are forc'd to send to the remotest Parts of the Earth, in the midst of so many Perils? What Profit have the *Portuguese* made by transplanting the Orange-Trees of *China* into their own Country? The very Oranges that they sell to the *English*, *French*, and *Dutch*, bring them in vast Sums of Money. Hear what the learned History of the Royal Society of *London* says to this Matter. By these Transplantations, says the *Historian*, we might procure ourselves prodigious Advantages. The *China*-Oranges, which for a little time past have been cultivated in *Portugal*, bring in to the *Portuguese* a great Revenue from the Town of *London* only. The Vines of the *Rhine*, that are transplanted in the *Canaries*, have produc'd a much more delicious Liquor: and the Rocks and parch'd up Sands of those Islands are thereby become one of the richest Corners of the Earth. We may likewise alledge an

Example of what is likely to succeed to a Miracle: *Virginia* has already produc'd some Silk, and may in time supply the greatest part of *Europe* with that Merchandize; which will be a certain Treasure to our Kings. And indeed, if the Silk-worms succeed there, as it can scarce be doubted but they will, the Profit will be inconceivable. Of this we may be morally assur'd by the great Number of the Caravans and great Cities of *Persia*, which are maintain'd by the sole Manufacture of Silk; and by the prodigious Revenues, which that Commerce brings into the Treasury of the *Sophy*, part. 3. Sect. 28. These are the Reflections of the Learned Author of that History. Happy the Nations that have such Philosophers, who continually study, not empty Notions, imaginary Vortexes, uncertain Atoms, and fantastical Elements; but the Utility of the State, how to procure Plenty of all things, and the Happiness of the People. I can not forbear saying, that in this single Dissertation of that Historian there is more good Philosophy, than in all the idle Contemplations of *Descartes* and *Gassendi*.

All who wish well to the publick Good of their Country, are ravish'd with Joy, when they see learned Men, and of Distinction too, apply themselves to procure Plenty to their Country, together with all the Conveniencies of Life. This is the Reason, that a Book intitled, *Sylva & Pomona*, compos'd by M. Evelyn of the Royal Society of *London*, has been receiv'd in *England* with so much Applause.

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The first Part of his Book teaches to cultivate and preserve the Woods and the Forests, that *England*, may never want Plenty of Wood for Building, and for Fuel: which is, *says the Author*, of great Moment to the State; where Wood to build Ships and Houses ought never to be wanting. His *Pomona* exhorts the *English* to plant Orchards, that they may be supply'd with Cider. By this means, *says he*, we shall have of our own Growth, a Liquor more agreeable to our Constitution, and even sweeter and more Delicious than several Wines that are brought into *England*, and that can not be drunk without Sugar. There is less trouble, less time, less Expence, and fewer Persons requir'd to make Cider, than to cultivate Vineyards. And after the Example of King *Charles II.* who immediately after his Restoration, caus'd Nurseries and Orchards to be planted in many Places: several considerable Persons have done the like, and already enjoy the Pleasure of drinking that wholesome Liquor, that deliciously repays them for their Expence and their Trouble. Thus we shall shortly see our Plains become the *Elysian Fields*. *England* will be the *Fortunate Islands*, the Gardens of the *Hesperides*. When I behold these yellow and ripe Apples in our Orchards, methinks I see the Apples of Gold that *Alcinous* cultivated in the Island of *Corfu*, which indeed are but a Fable; but the tasteful Cider, which we begin to drink in *England*, is the pretious Juice of the real and charming Fruits of those inestimable Trees, which we have found means to transplant from *Normandy*.



dy into England. *Et tum revera merebimur ve-*
tus Nomen Fortunatarum Insularum & horto-
rum Hesperidum. Aët. Philosoph. Novemb.
 1669. If we are cool and remiss in regard
 to our own Interest, this methinks should
 be sufficient to warm, and inspire us with E-
 mulation.

Nothing is more easy than to transport rare
 or useful Trees from one Country to another,
 even from *Asta* into *Europe*. We need only
 the Tops of the Plants, which may be kept
 from all harm in a little Moss, or in Herbs,
 humected even in Sea-Water, mixt with a little
 Fresh. These Tops of Branches will shoot out
 Roots to a Miracle, by the Vegetation in water
 only. I say the same too of the Kernels, of Nuts,
 and of Fruits. Water is a wonderful Dissolvent,
 and of great Virtue to open the Bosom of the
 Seeds that contain the Plants.

IV. I should never have done, if I mention'd
 all the Advantages, and all the Pleasures of
 this new manner of multiplying Plants. The
 Trees bear Flowers and Fruits the sooner; as
 has been said of the little *Indian* Pome-granate-
 tree, which three Months after its formation,
 was adorn'd with three beautiful Flowers. 'Tis
 rare to see Grafts produce Flowers and Fruits
 the first year; and it only weakens them to do
 so. But allowing that they did fructify so
 soon, must we not raise up Stocks to graft
 them on? This is a Delay from which we are
 exempted by our new Method; which is not in
 the least difficult, but all pleasant and easy.

One Word more, and I have done. Were it possible to have and preserve Rain Water to fill the Vials, the Success would be the better; because that Water is impregnated with the Nitre of the Air? 'Tis a pure and fruitful Water, and the Plants drink it with Pleasure. *Vatruvius*, who was as knowing in Physicks as in Mathematicks, prefers Rain-Water before all other sorts. 1. Because it falls from the Clouds that are impregnated with Seminal Virtues, which the Vapours and Exhalations have rais'd up from the Earth and from the Sea. And 2. Because before it falls upon the Earth, 'tis filtrated thro' the Air, from which it imbibes a Nitre, that renders it fruitful. *Ex imbris aqua Salubriores habet virtutes, per Aeris exercitationem percolata pervenit ad terram.* De Architect. Lib. 8. cap. 2.

I would not scruple to put a little Nitre into the Water in the Vial; and when I made the Experiment on Branches, Seeds or Kernels of any Value, I would throw in a little Sugar likewise; for Sugar is a balsamick Salt, that will serve to qualify whatsoever may be too violent in the Nitre. To conclude this Point, we have seen that *Ghiarefchius*, to hasten the Vegetation mingled some Salts in the Water; and that *Sir Kenelm Digby* put into the Nitre a Matter, proper to render it more pleasant. All we have said on this Subject, is only as it were a Sketch or rude Draught, which 'tis easy for others to improve and perfect. Whoso understands the Connexion of the Superior Things with the Inferior, will, says a learn'd *Arabian*, easily pene-

penetrate into the greatest Myſteries of Nature.
Qui ſciſſerit catenam connectentem ſuperiora inferioribus, hic myſteriorum maximum penetrabit.
 Algaziel.

CHAP. X.

This Method of multiplying Plants by the Means of Water, is founded on the Philoſophy of the moſt Antient Philoſophers, which was renew'd by the Learned of the laſt Century.

TH O' the Holy Scripture was not given us, to make us Philoſophers; and tho' we ought to ſearch there, rather the Science of Salvation, than the Knowledge of natural things; 'tis nevertheless our Duty not to ſwerve from its Words and Senſe, when we explain the Phœnomena's of Nature. 'Tis ſaid in the Book of *Genesis*, that God created the World in ſix Days. To this I adhere: for where Faith ſpeaks, Reason muſt be ſilent. 'Tis related that *the Light was made the firſt Day*: No Arguments ſhall perſuade me to believe the contrary. I therefore without more ado reject an Opinion which holds, That *Light was not the firſt thing that God made; becauſe Light is only an Effect of the Sun, as the Sun is only an Effect of the Diviſion of Matter, and the Diviſion of Matter itſelf only an Effect of local Motion.* There is indeed Senſe
 and

and Reason in this; but yet I cannot assent to it. I must first know how to reconcile this Argument with the History of the Creation of the World: but can not see how that is possible to be done; because, tho' Light be an Effect of the Sun, 'tis expressly said in *Genesis*, that the Light was made the first Day, and that the Sun was not made till the fourth.

If the *Manichees*, who so warmly oppos'd the Book of *Genesis*, had known the Distinction of *Substantial* and *modal* Beings, they would have press'd it hard upon St. *Augustin*; but by good Fortune for that holy Father, *Cartesianism* was then wandering with its three Elements, and *Vortexes* in imaginary Spaces. Those Hereticks would not have fail'd to accuse *Moses* of inverting the Order of Things, by putting the Creation of a *Modal Being*, as is the *Light*, three days before the Creation of the Sun, of which 'tis only an Effect. But St. *Augustin* would have answer'd them as he has done in other the like Occasions; that 'twill be always glorious for us to believe what God says: and never dishonourable not to comprehend all he says: and that tho' our Reason be too weak to answer the Objections that are made us, our Faith should always be strong enough to deride them. *Hac etsi Ratio refutare non posset, Fides tamen irridere deberet.* Cont. *Faust.* Lib. 33. cap. 6.

If we may rely on the Text of *Genesis*, all things seem to have been taken and form'd from Water. The holy Words are as follow. Vers. 1. In the Beginning God created the Heaven and

und the Earth. 2. And the Earth was without Form, and naked: and Darknes cover'd the Face of the Abyss: and the Spirit of God mov'd upon the Waters. 3. Then God said, Let there be Light: and there was Light. 6. God said likewise, Let there be a Firmament in the midst of the Waters, and let it divide the Waters from the Waters. 9. And God said let the Waters that are under the Heavens be gather'd together unto one Place: and let the Dry-Land appear: and it was so. 20. And God said: Let the Waters bring forth abundantly, the living Creature that hath Life, and the Fowl that may fly above the Earth in the open Firmament of Heaven. Gen. chap. 1. At first sight the Mind is convinc'd that Water was the Womb from whence God drew all things. Water is the Chaos that proceeds from nothing by Creation. God drew the Earth from it, by separating the thickest Part of these Waters. And of this slimy Part he form'd afterwards the Plants, and then the Animals. Of the clear Waters he made the Fish, and the Fowl. Thus all the Bodies of the elementary World derive their Origin from the Waters.

Tostatus, inquiring why 'tis said in the Scripture, that the Fowl were made of the Waters, as well as the Fish, answers that there are two things in Water: 1. A Part that is thicker and heavier than the other, and inclines to Mud, which matter was most proper to form the Fish. 2. There is a light and volatile Part, that exhales into Vapours, as may be seen in boiling Water. Now this subtile Part of the Water was most proper for the Fowl, that were

were to rise up, and fly in the Air. Conve-
*niat aquæ quod ex ea pisces producerentur: quia
 in aqua est aliquid crassum, & ponderosum, quod
 ad naturam piscium competit: aliud autem est
 subtilius resolutum in modum vaporis, quod ele-
 vatur in altum, sicut apparet in aqua bullenti;
 ad hanc partem subtilem pertinerent aves, et
 ideo eleventur in altum. Quæst. 325. in
 Genes.*

St. Basil, St. Ambrose, and several other ho-
 ly Fathers believ'd, that the Fowl as well as
 the Fish were form'd of Water, and I see no
 reason to doubt it. St. Thomas too was of the
 same Opinion; *Et ideo productio avium aquæ
 ascribitur. Quæst. 71.*

This was likewise the Doctrine of the Phi-
 losophers, who first appear'd in the World;
 and therefore we may say that 'tis as ancient
 as Philosophy itself.

Thales of Miletus, who was the first among
 the Greeks that apply'd himself to study Na-
 ture, and whom *Diogenes Laertius* places at the
 head of all the Philosophers, whose Lives he
 has written, taught, that *Water was the mate-
 rial Principle of which all things were made.*
 This Philosopher, says *Cicero*, was the first who
 treated of Physicks. He held water to be the
 Origin of all things, and that God is a Spirit
 who made use of that Element to form all
 natural Bodies. *Thales enim Milesius, qui pri-
 mus de talibus rebus quæsit, aquam dixit esse
 initium rerum; Deum autem eam Mentem, quæ
 ex aqua cuncta fingeret. De Nat. Deer. Lib. 1.*

Plutarch

Plutarch says that this Philosopher believ'd not only that all things were made of Water but that they return'd all into Water likewise. This shews that that Founder of the Ionick Sect, had penetrated by the Depth of his Understanding, into all that our Chymists have since been able to discover by their Analysis, and with much Toil and Labour. For after all it is not long since we have had reason to believe, that all things return into Water. The *Journal des Savans* of the 12th of December 1678, speaks of an Author, who asserts that Water is the material Principle of all things. He proves it. 1. By the Words of *Genesis*, that seem expressly to say so. 2. Because not only all things take their Growth from Water, either immediately as Fish, and Plants; or mediately, as the Animals, that live on Herbs and on Fruits, which are only the Element of Water variously coagulated: but likewise because all things return into Water, not excepting even Metals, after they are reduc'd into Lime, or into Salts.

Seneca, having related this Opinion of *Thales*, adds something of his own, which is very fine, and conformable to the Theology of Christianity: and I would fain know from whence he borrow'd it. After having said that he willingly assents to the Doctrine of *Thales*, that Water is the first Element, and that all things are come from it; he adds: The World owes its Beginning to Water, and will end by Fire. *Ita ignis exitus mundi est, humor primordium.* *Quæst. Nat. lib. 3. cap. 23.*

'Tis very likely, that *Thales* invented not this Opinion concerning Water, but that he took from the *Hebrews* what he said of it. My Reason is this. His Doctrine is certainly the Doctrine of *Moses*, and by consequence of the People of God. If so; it might easily get among the *Phœnicians*, a neighbouring Nation to the *Jews*, and always conversant with them, as *Strabo* positively says: *Nonnulli totam Syriam in Cœlosyrios & Phœnices dividunt, dicentes quatuor nationes his esse mixtas, Judæos, Idumæos, Gazæos & Azotios.* Geograph. Lib. 15.

The *Phœnicians* carri'd into *Greece* the first Seeds of Philosophy. *Strabo* tells us that one *Moschus* of *Phœnicia* and of the Town of *Sidon* went into *Greece* before any Philosopher had appear'd there, and before the Siege of *Troy*; and that he explain'd the *Phœnomena's* of Nature by the Doctrine of Atoms: *Per minimas materia particulas.* Geograph. Lib. 15.

The *Greeks* were not only oblig'd to the *Phœnicians* for all their Erudition: but also for the Invention of Letters and for the Art of Writing; as *Lucan* witnesses in his *Pharsalia*.

*Phœnices primi, fama sic creditur, ausi
Mansuram rudibus vocem signare figuris.*
Lib. 3.

Thales therefore found this Opinion established in *Greece*; that Water was the Matter of which the elementary World was form'd: Perhaps too he took it from the Fountain Head: for *Diogenes Laërtius* says, that many believ'd he was originally of *Phœnicia*:

if so, he might probably have Conversation enough with the *Israelites*, not to be ignorant of their Philosophy concerning the Creation of the World : and thus might very well have taken from the first Chapter of *Genesis* his Opinion concerning the Formation of Natural Bodies : there the Water is evidently represented as the material Principle of all things : for how can we otherwise understand this Chaos, this Abyss, this Heap of Waters, upon which the Spirit of God mov'd to give them Fertility. Hence the Water became, *παραπρωτα*, that is to say, impregnated with all the Seeds, and with all the Principles, from whence God took all the Plants and Animals, that adorn and People the Earth and the Sea.

What confirms me in this Opinion is the Honours which the *Egyptians* render'd to Water ; and which were too great to suffer me to believe, that they were paid on account of the Good Offices which the *Nile* did them in making it self, to use *Pliny's* Expression the Husbandman of their Lands. *Vitruvius* says expressly, that there was in *Egypt* an Order of Priesthood establish'd, on purpose to honour Water, and that all the Ceremonies tended to make it be understood that all things owe their Being to that Element. *Qui sacerdotia gerunt moribus Aegyptiorum ostendunt omnes res à Liquoris potestate consistere* Præfat. Lib. 8. The *Egyptians* no doubt had learnt from the People of God, who had been so long in Bondage among them, that all the Bodies of the Elementary World were taken from Water.

This Opinion has been renewed in these latter Days, and demonstrated by Proofs that confirm the Doctrine of the Ancients. We have Chymists who pretend they can by Art extract from Water Minerals, Vegetables, and Animals, and give new Creatures to these three Races of Nature. Nothing can more evidently prove that all those things were originally taken from Water in the Creation, than to shew by certain Experiments, that the Industry of Men can arrive to extract them from thence at this day.

'Tis most certain that *Paracelsus* espous'd the Opinion of *Thales*, as may be prov'd in many Places of his Works.

The Author of the *Mosaick Philosophy*, explaining the ninth verse of the first Chapter of *Genesis*, says, that the Waters that are under the Heaven, are the Catholick, that is, the universal Element, from which the other Elements were taken. To which purpose he cites an Axiom of the Ancient Philosophers: *Water is the Mother of the Elements*: Seeing it is the only universal Element that contains all the rest: *Aqua est enim mater elementorum, cum revera sit unum catholicum elementum, in quo omnia.* Philosoph. Moyfaic. Lib. 4. §. 1. cap. 5.

Van-helmont goes from Argument to Experiment, to convince himself that Water is the material Principle of Plants. This is the particur Point that relates to our present purpose. His Experiment was this. He took two hundred pound weight of Earth, that had been well dry'd in an Oven. He put it in a large Earthen Vessel, and planted in it a

Sallow that weigh'd five Pounds. To keep any thing else from getting into the Vessel, he cover'd it with a piece of Tin, full of little Holes, that he might water the Earth. At the End of five Years he pull'd out the Tree, and found that it weigh'd one Hundred sixty nine Pounds and three ounces, beside the Leaves that had fallen off during the four Autumns. Then causing the earth to be dry'd again, he found that its Weight was diminish'd but two Ounces. Thus he had a hundred sixty four Pounds of Wood, Roots and Bark, that were form'd of Water only. Thence I concluded, says he, that all Vegetables draw whatever they are from the single Element of Water. *Omnia vero vegetabilia immeditate & materialiter ex solo aqua elemento prodire hac mechanica didici. Libra ergo 164. ligni, corticum & radicum ex sola aqua surrexerunt. Complex. atq. Mist. Element. figment. §. 30.*

This is not all. *Van-Helmont* farther pretends, that besides Plants, we may draw from the Element of Water, Marcasites, Stones Metals and even Animals. He speaks very positively in the Place I have cited: and in another, returns with so much pleasure to the Argument, that 'tis easy to judge, that the Philosophy of *Thales* was the favorite Philosophy of *Van-Helmont*: *sic totus lapis ex aqua, §. 31. Pisces & omnis pinguedo ex sola aqua sunt. §. 32.* He questions it not in the least. He boldly affirms that all the Petrifications; that is to say the Bones and the Wood that become Stones in certain Waters, are nothing but a Water, that is fixt, thicken'd, transmuted, coagulated, and corporify'd

porify'd. 'Tis not his fault that he does not make out his Assertion by the Text of the Holy Scripture. Hear how he explains the two first Verses of *Genesis*. The Earth, says he, was said to be all *naked and void*, because it had then neither Minerals, nor Plants, nor Animals. *The Spirit of God moved upon the Waters*; not that it might repose upon them, nor to have the Pleasure of floating on that vast extent of Waters; but that it might impart to them a Fecundity, proper to produce the three Races of Minerals, Vegetables and Animals, that were to store the Earth. Then the Spirit of God, this *Spiritus Domini qui replevit Orbem terrarum*, produc'd all this rich variety of Creatures, that fill the Void, in which the Earth in the Beginning was said to be. *In instanti universam terrarum lapidum, mineralium atque metallorum opulentam diversitatem protulit, quibus terra vacuitatem replevit. De Lithias. C. 1. §. 5.*

Palissy make a distinction of two sorts of Water; both of them nevertheless intirely united in one; and regards them as the source, from whence all material Beings proceed. In one of his Dialogues he speaks in this manner. Say what you will; but when you have thoroughly examin'd all things by the Effects of Fire, you will find my saying true, and confess, that the Beginning and Origin of all things is Water! the generative Water, not the common; but that which causes the Germination of all Trees and of Plants. 'Tis not I say the common Water, tho' without that too, no Tree, no Plant, nor even Men nor Animals can subsist. But

'tis because among the common Water there is another which I call *germinative*, for Plants; *congelative*, for *Minerals*; and *generative*, for animals; without which nothing can say, *I am*. 'Tis this that makes all seeds germinate; that supports and maintains Trees and Plants to the last: and even when they are consum'd and destroy'd by Fire, this *germinative Water* is found in the Ashes.

De Rochas has done more than any Philosopher to demonstrate the System of *Thales* of *Miletus*. He has extracted by Art, from the Element of Water only, Minerals, Plants and Animals, all of them full of Life and Action, Let us hear what he says. If he speak Truth no Philosopher ever yet better deserv'd our attention. Having, says he, discover'd such mighty Wonders in the natural Operations of Water, I was desirous to know what could be done by Art in imitation of Nature. I therefore took some Water, which I knew very well was not compounded nor mixt with any thing, except only with that Spirit of Life, which God gave the Waters at the Creation of the World. By means of an artificial and proportionable Heat, I prepar'd and dispos'd it by the Gradations of Coagulation, Congelation, and Fixation till it was turn'd into Earth; which Earth produc'd *Animals*, *Plants* and *Minerals*. I reserve to say what Animals, Plants and Minerals till another opportunity: But the Animals mov'd of themselves, eat, and produc'd their Like: and by their Resolution, or the true Anatomy I made of them, I found them to be compos'd of much Sulphur, a little Mercury, and

and less Salt. The Vegetables germinated and produc'd their like also; and by the Dissection I made of them, I discover'd them to be compos'd of much Mercury, of an indifferent Quantity of Sulphur, and a little less of fixt Salt. The minerals began to grow, and augmented in Bulk by changing a Part of the Earth, that was dispos'd so to do, into their own Nature. And by this truly demonstrative and spagyrick Art, I found that they were compos'd of Salt, a little Sulphur, and less Mercury. *De la Nature. Chap. 2.*

De Rochas seems before hand to have laid down Principles that are intirely favourable to the Vegetation of which we are speaking; which being effected by Water alone, warm'd by the Heat of the Sun, is according to his Doctrine wholly Physical, and conformable to the Genius of Nature, that operates all things in the three Races of Vegetables, Minerals and Animals, by the continual Society and Communication of the Sun with the Water. His whole *Treatise of Nature* rould only on this Point, that the Sun and the Water are the two Principles that give a Being and Life to all mixt Bodies; that the universal Spirit is Water, pag. 45. that the Society of the Water with the Sun produces Animals, Vegetables and Minerals without the assistance of any thing else. Pag. 48 and 55. So that Life is contained in the Water, and preserv'd or nourished by the inherent and never failling Influences of the Sun. pag. 49. This he proves by the Vegetation of an Abricot-tree, which he had observ'd and followed from the first Sprout of the

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Kernel

Kernel in the Stone till it became a great Tree : whence he concludes, that the Tree how large soever it was, took not its Bulk from the Earth, seeing it had not made a Vacancy or Hollow Place around the Roots : It therefore necessarily follows that the Water or Sap, that mounts between the Bark and the Trunk of the Tree, must corporify it self, as it does, by means of the Spirit of Life, contained in it ; and of which we must consequently conclude, that the Water is abundantly full. page. 43 and 44.

Boyle seems to have declar'd himself for the Opinion of *Thales* ; but before he would embrace it, he had Recourse to Experiments: which indeed he made only upon Plants ; but yet they are sufficient to prove that no Doubt can be made of the Vegetation by Water only. He tells us that in the Month of May, he order'd his Gardiner, to get some good Earth and to dry it in an Oven. He weigh'd it exactly, and rais'd in it from seed, one *Indian Melon*, a Plant that generally sprouts very fast. The Gardiner took Care to water it well, and towards the middle of October they took the Melon, Plant and all, out of the Earth. The whole weigh'd three Pounds wanting three Ounces. Then the Earth was again dry'd in an Oven, and prov'd to be as weighty as before : *& aquam plane priori quantitatem deprehendi.* Chymist. Sept. Part. 2. Thence he concludes that the Melon, and whole Plant were only Water, to which, Motion had given a shape and new Contexture. This was properly coagulated Water.

The Experiment which is so frequently made with the End of a Sprig of Mint or Balm, which being put into a Vial of Water, shoots out abundance of Roots and Branches, blossoms and runs to seed, is yet a fuller Proof, that Water only changes it self into very solid and very different things; and that 'tis sufficient for the Nourishment of several Plants. Water, as it filtrates and sifts it self thro' the Pores of a little Twig of Balm, or of any other Plant, hardens and corporifies it self into an Infinity of Figures, that resemble not one another. For how little a similitude is there between an Infinity of Plants, Leaves, Stems, Branches, Flowers, Seeds and Fruits, of which water was certainly the Sole material Principle? Boyle tells us too that he had made the little Experiment on a Branch of Balm; and that what most surpriz'd him in that charming and Innocent Spectacle was to find that Plant to have as strong an Odour of Mint, as if it had grown in the Ground. *Foliis Mentham insigniter redolentibus.* pag. 38.

I never omit neither about the middle of the Spring, to put a little sprig of Mint into a Glass Vial, were it only for the Pleasure of seeing the Verdure and the Flowers last six Months at a Window, without the least Earth. The *pensile* Gardens of *Babylon* would not please me more: for the Delight seems to me to be always equally new.

Boyle, who is ever a little obscure concerning the Vegetation of Plants by Water only, returns so often to the Subject in several Places of his Works, that we may plainly see

see, that this Magick of Nature, which works so many different things with this single Element, puzzled him not a little. He seems not to be able to believe what he sees. He tries every thing, to be assured of a matter of fact, which he takes to be of Importance, and that would be very difficult to reconcile with the substantial Qualities and Forms of the Peripateticks. Thus you see why he returns so often to these Vegetations, that are made by the simple Element of Water. He is a Naturalist, who will not run hand over head, nor decide any thing without full Cognizance of the Matter: But if it be once well made out, that Water disguises it self in this manner, and takes so many different shapes, Boyle prescribes and banishes for ever from the Dominions of good Philosophy, all substantial Forms and Qualities. To be certain, says he, that Plants nourish themselves and grow in Water, I have made several Experiments of it, as well to prevent any Objections that might be started concerning it, as to have the Pleasure of seeing the Progress and Sports of Nature in the Transmutation of Water: *Sed ut progressum Nature in aqua transmutanda non sine voluptate quadam observarem.* I find, says he, in the Journal of my Experiments, that Perriwinkle, Cresses, Mint, and Crowfoot live to a miracle in Vials fill'd with Water. I have had some of these Plants that have vegetated nine Months together, after they had shot out long Roots. Some have weather'd out the Autumn, and even the Winter, with all possible Vigour, as Horse-radish. From all which I infer, that the substance of Water, which

which is of it self fluid, insipid, without Taste, transparent and volatile, may by a new Contexture be transmuted into Bodies, that are solid, colour'd, opacous, savory and fixt. But I am most of all surpriz'd that the Plants, which owe their Nourishment and Growth to common Water, are as much indued with their Qualities, which we call *specifick*, as if they had grown in the Earth. The *Perrivinckle* is vulnerary, astringent and febrifuge. The *Ranunculus* is sour, caustick, and perhaps to be counted among the deadly Plants, tho' it be nourish'd only with good Water. *Cresses* purifie the Blood, and give ease to the scurbutick and dropical. *Balm*, tho' it grow only in Water, is not less stomachal and diuretick: and there are some skilfull Persons, who make the same use of its Leaves, that we do of Tea. I know it will be said, that there are in Water some saline and nitrous Particles, that suffice to give a Consistency to the Productions, that are made in that Element: but I know not whether it be true: at least it must be prov'd before it deserves Credit; which I believe can scarcely be done. And all will be of my Opinion, who reflect what a prodigious Quantity of clear Water must be exhal'd, to get an Ounce of dry Sediments, either saline or earthly: *Quam vasta aqua limpida Quantitas ad obtinendam aridorum residentiam, sive salinorum, sive terrenorum unciam necesse est exhaletur.* De Orig. Qualit. & Form. Part. Hist. Art. 2. Thus *Boyle* we see is very much unresolv'd, and knows not what to think of these aquatick Vegetations.

When,

When this learned Man argues against the four Elements of the *Peripateticks*, and the three or five of the Chymists, he returns again to the Vegetation by Water only; and says: If what *de Rochas* alledges be true, we must allow, that not only Plants, but likewise Animals and Minerals may be form'd by the single Element of Water: *si admittere historium velis quam ex Domino de Rochas commemorabam, tum non Planta modo, sed & animalia, atque etiam Mineralia produci ex aqua poterunt.* Dub. & Paradox. Chym. Phys. part 6. And allowing the Truth of that Story, he says very well, that Minerals, Plants and Animals are nothing but *Water in Disguise.* *Nil sunt, nisi aqua larvata.*

Bacon, even in his time, discover'd a wondrous Fecundity in Water; especially in regard to Plants: He says, 'tis easy to forward a Plant, in a manner wholly surprizing: by supplying it with a more succulent and active nourishment, than that which it draws from the Earth; and that 'tis Water alone which contains this Nourishment, so efficacious in Vegetation: *quod aqua prestat.* For Example: Take a Damask Rose-tree with all its Roots, and set it half a Foot deep in a very clear Water: keep the Vessel 'tis in, in a Chamber: In ten Days the Rose tree will be cover'd with Leaves of a beautiful Green. Try this Experiment in the Spring, 'twill bear Roses as if it grew in the Earth. Hence we may conjecture that a Rose-tree wou'd blow in a Pond, if the Root only were in Water, and the Rest were propt to keep it upright. *Sylv. Centur. 5. n. 104.* He

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adds that having had from *Flanders* the Bulb of a Tulip, he put it into Water, and that in seven days it sprouted and work'd its way out, as if it had been in the open Ground. I put likewise, says he, into Water the Roots of some Beets, Burrage and Horse-radish, having first cut off the Leaves. In less than six Weeks they shot out very fine Leaves that lasted till the Month of November. *Sylv. Cent. 5. n. 408.* These Examples make it evident that water is the chief Nourisher of Plants : and that the Earth does no more than keep the Plant upright, and protect its Roots from the Violence of Cold and Heat. The Drunkards, who grow so fat, know by Experience, that the use of Liquids is highly nourishing. *Experimento potatoribus proficuo. Sylv. Cent. 5. n. 411.*

Tho' the Petrifications of Plants be a Destruction of the Plants themselves, which thereby leave the Race of Vegetables to be adopted in that of Minerals, yet this is the proper Place to treat of them : the rather because Water is the material Principle of all Petrifications. If we consider that 'tis generally the Parts of Plants, as the Wood, the Bark, the Roots ; or the Parts of Animals as the Bones, on which the Miracles of Petrification are most frequently wrought : we may say, that Nature in these little sports, wherein she gives so many different Shapes and Qualities to Water, degrades these Vegetables and these Animals, by debasing them to the Rank of Fossils. But be that as it will : the Petrifi'd Wood and Bones being only a coagulated and fixt Water, these

these Rarities of the Cabinets of the Curious are so many Demonstrations of their Opinion, who hold, that Minerals may be extracted from the pure Element of Water. I have perhaps the finest Petrification in the World. 'Twas sent me from *Pontcaudemer*, at the time when they began to dig that famous Canal, that conveys the Sea to the very foot of the Walls of that Town. This Curiosity was originally a long stick of Beech, that happen'd to be in the Fascines, with which that Ditch was formerly fill'd up. There the Water penetrated it with its Salts, and Nature metamorphos'd it from Wood into Stone. It retains the Characters of Beech, and of its first Nature. 'Tis easy to perceive the Bark, the Knots, and even the Grain of that Wood. But what infinitely adds to the Rarity of it, is a golden metallick Vein, that has form'd it self in it, and may be distinguish'd perfectly well. This Vein of Gold sets it off to a Miracle; and seems to have been plac'd there only in Honour of the Opinion of those Philosophers, who hold that Water is the universal Matter, of which Metals, Plants and Animals are compos'd. Who knows but Nature, by this rich Gilding meant to make amends to this Vegetable, for the Injury she had done it, in reducing it to the Race of Minerals.

We have seen that Plants nourish themselves with Water only: if we had been exact in our Inquiry, we should perhaps have found, that besides Fish, there are some Animals upon Earth, that never dye as long as they

they have any Water. Boyle in his Republic of Learning says: *I remember to have read in a Relation of Canada, Written by a Monk, that the Savages of that Country, during the time of Famine, to which Misery they are often expos'd, support themselves for I know not how many Weeks with nothing but Water and Tobacco.* February 1685. Tom. 1.

With whatever good opinion we are possess'd in favour of *Aristotle*, 'tis impossible to explain by his Philosophy, the Mechanicks of Nature, in the Vegetation of Plants. He was indeed a great Man, of a sublime and penetrating Genius. Had he not been too much given to Innovate, and to mix his own Thoughts in the antient Philosophy, he would have been of great help towards the Understanding of the Philosophers, who preceded him. But he was no less ambitious than his Pupil, and would needs preside in Philosophy, and be a sort of Monarch over it: which put him upon suppressing all the Antient Doctrine, to establish the Kingdom of his new Tenets; otherwise he would have render'd infinite Services, especially to Physicks; in which he has often gone out of the Way, by endeavouring to discover new Paths. The Heat of the young *Alexander*, who, like Lightning over-ran and subdu'd all *Asia*, inspir'd him with an Emulation to commit the like Ravages in the Sciences, which that Prince did in the Provinces of the East; and to overthrow all the antient Philosophy, that he might substitute one wholly new in its Room. *Hobbes* says, that the Preceptor was spoil'd by the Example of

of the Disciple; and that *Aristotle* vexed and mad that he could not govern the Publick Affairs, confin'd himself to found a new Dominion over Words. *Cepit, opinor, Aristotelem libido quadam pro Authoritate sua; cum rerum non posset, verborum tamen censum peragendi.* Cap. 2. Logic.

And indeed, how can we, in rendring intelligible the Mysteries of Nature, make use of frightful Terms, which can scarce be pronounced without taking up Arms against good Sense? Shall I say with the *Peripateticks*, that a Plant nourishes it self, because it has a *nutritive, attractive, retentive, digestive, excretive, expulsive Faculty*. This Fustian of theirs, and many other Terms no less barbarous, would not have much contributed to make me be understood. *Hannemannus*, of the Academy *Curiosorum Naturæ*, openly declares against the Philosophy of *Aristotle*, and of all the *Peripateticks*; as being very incapable to give us a solid Knowledge of Plants. *Ex Philosophia Aristotelica solida Cognitio Philosophica Plantarum hauriri non potest, cum ea omnia involvat terminis logicis, & Formarum & Qualitatum somniis.* Method. cognosc. simplic. Vegetab. pag. 116. We too have been forced to do the like, that we might not wrap up the Wonders of Nature in Terms of pure Logick, and under Qualities that serve only to create confused Idea's in the Mind.

The most zealous Sticklers for *Aristotle* are forc'd to confess, that his Principles, in matter of Physicks, are not proper to explain the most simple Effects of Nature. *Descartes* could

could not do better than in leaving them : but before he did so, several Philosophers had discover'd the Weakness and Insufficiency of the Philosophy of that Chief of the Peripatetick Sect. Each of them saw very well, that by blindly following his Steps, they should never retrieve Physicks from the horrible Darknes that totally involv'd it. They perceived but too well the necessity of having a better Philosophy. Some complained with too much Spleen of the blind Servitude, in which the World had liv'd for two thousand Years under the Yoke of a Pagan Philosopher, to whom the Fathers of the Church had shewn so much Aversion. Some endeavour'd to do better, and did worse. Others of better Judgment were more happy in their Attempts, but without much Applause. The Philosophy of him whom they attack'd, had gain'd too much credit, to be run down so easily at first. To declare against the Writings of *Aristotle*, was to fall out with all the Philosophers that were in the Schools of the whole Earth ; where for two thousand years no other Philosophy had been taught but his. He claim'd by Possession, and even an ill Title supported by the Quirks of Law is hard to be overthrown. Too happy had it been for the new Philosophers, if the Followers of *Aristotle* had contented themselves with barely rejecting the Lights that were offered them : but they went on to Actions, which prove but too well, that an obstinate and inveterate Errour, makes a cruel use of its Authority.

On the other hand, the Adversaries of *Aristotle* left no Stone unturn'd to cry down his Philosophy. There are some Declamations on that Subject, that would provoke to Laughter any Man that reads them seriously. We need only see how *Robert Floud* attacks that great Man, to convince us of what Errors, of what Extravagances Men are capable, even they who make Profession of Philosophy, when their Thoughts are prepossess'd in prejudice of another. He is not satisfied with falling foul on *Aristotle* at every Turn, but forgets himself so far, as not to consider that this Philosopher was a Heathen, and declares a religious War against him, for not having explain'd the Creation of the World by the Text of *Genesis*; and because he has not Philosophiz'd on the Meteors in the Terms of *Job*, and of the other Authors of the Holy Writ. To hear him speak, one would believe he had to do with a Rabin, with a Teacher of some Synagogue, who has eternally the Bible in his Hands. He treats with *Aristotle*, as one might do with *Moses Maimonides*. What Obligation did *Aristotle* lie under, of explaining the Effects of Nature by the Terms of the Books of *Moses* and of *Job*, of which perhaps he had never heard mention: and for whose Authority the Paganism he profess'd, excus'd him from having the least Deference.

When *Floud* explains the Formation of Thunder, and of Lightning, he pays off *Aristotle* and his Followers with too violent a Zeal; and never stops to take Breath, till with a cool and serious Air, capable of freez-

ing his Readers, he comes to relate the Adventures of two Persons, whom, as he affirms, the Justice of God struck dead with Thunder, for having argued of this furious Meteor according to the Philosophy of *Aristotle*. You shall see, says he, how severely God punishes those who adhere to the Doctrine of this Pagan; and who like him talk indiscreetly of the Generation of Thunder. This is his Prelude, now hear the Story.

A Country-woman of *Ireland*, says he, had in all appearance heard some *Irish Peripatetic* say, That Thunder and Lightning were only a Fiery Exhalation, lodg'd in the Womb of a cold and wet Cloud: and upon this slight Idea she was not in the least afraid of them. One Day when it Thunder'd, this audacious Creature laugh'd at her Companions, who she saw were frighted, and the Thunder fell upon her, and kill'd her outright. Thus perish'd, says he, this Wretch for having blasphem'd like the *Peripateticks*. Then he adds, I will shew you what the idle Philosophy of that Sect deserves in the sight of God. *Sed ut ad meritum insipientis Peripateticorum Assertionis præmium jam instem.* A young Man, full of *Aristotle*, was talking idly of Thunder, to recover his Companions from the Dread they had of it. He told them that Thunder was only a hot and dry Exhalation, rais'd from the Earth by the Heat of the Sun, into the Middle Region of the Air; and that by the *Antiperistasis* of Heat and Cold, it kindled in the Bosom of a Cloud. While this impious Wretch, says he, was blaspheming in this manner, the Light-

ning struck him only dead, of all the Company. Thus you see how God abominates the Philosophy of Aristotle. My dear Christian Peripatetick, take warning by these great Examples. *Atque ita justo Dei Iudicio condemnata erat Aristotelis sententia. En & ecce, mi Peripatetice Christiane, exempla notatu digna.* Philosoph. Moysaic. Sect. i. lib. 5. cap. 2. This is a Moral Style, becoming a Preacher, and extremely patheticall. What moves most in all of it is not the Object he lays before us, but his own Folly, which he ought to be ashamed of. There is neither Reason nor Justice in thus scurrilously treating the Philosophy of Aristotle. But let us hear another of his Adversaries, who is more moderate in declaiming against the Peripateticks.

I mean Stephen de Claves, an ingenious Chymist, and profess'd Enemy to Aristotle; whom he attacks not by Miracles and Visions, like the other, but by weighty Reasons, of which his Writings are full. He was not spoil'd with the Philosophy that then reign'd in the Schools, but argu'd with a Superiority of Genius, peculiar to himself. He mistrusted the beaten Road that had been follow'd for two thousand Years, during which the Philosophers being subjected to the Yoke of the Peripateticks, had forgot to make Use of their Reason; and reduc'd the Minds of all Men into Servitude, to subdue them to the Obedience of Aristotle. He inveighs not only against that Philosopher, but treats those as roughly, who pretend to force Mankind to Philosophize as that Heathen had done: and he is of Opinion, that to place the Writings

ings of *Aristotle* on the Throne of Philosophy, is to give a dangerous Blow to the Christian Religion. But let us hear his own Words. The Colledge of *Conimbre*, says he, give themselves a great deal of Trouble to make their Opinions agree with *Aristotle's*: 'Tis a misfortune, which cannot enough be blam'd, nor lamented, that for so many Ages together, such a number of Great Men have been oblig'd to be subject, nay even in Bondage to a Man, as Fallible and Erroneous as others : inasmuch that there has been, and still is an infinity of learned Men, who would think themselves Hereticks in Philosophy, if they had ever thought to search after Truth elsewhere than in the Writings of their Master. This is so great a Stupidity, that we ought not to be astonish'd, that Philosophy lies unmanur'd, or at least is so over-run with Weeds and Thorns, that 'twill require an Age to obtain an indifferent Knowledge of it ; instead of a few Years, nay I even dare to say, instead of a few Months ; if Men would take upon themselves the Liberty of searching the Truth in the Things themselves, rather than in the Writings of a Man, like other Men, and of a Pagan too, who is fallen into so many Errors, as are capable to seduce us from several Articles of our Faith. His Followers Inquire in vain, whether he had any Knowledge of the Creation, which is one of the great and principal Articles of our Belief ; since *Aristotle* would deprive us of it, by asserting the World to be Eternal, in Contradiction to the express Texts of the

Holy Scripture, and especially when he endeavours to prove that *Nothing is made of Nothing*: and that it was of Necessity that there should always have been a pre-existing Matter, to establish his Opinion concerning Eternity. Happy therefore are they, who boldly seek for the Truth in Physicks, without submitting themselves to the Opinions of a Heathen Philosopher. *Justin Martyr* compos'd a Book on purpose against *Aristotle*, where he proves, that we ought to assert our Liberty, in making use of our Reason, in all things that relate not to Faith. And the Learned Spaniard, *Catherina Olivia* made no scruple in her Writings to contradict the Philosophy of *Aristotle*, &c. *Des Principes & Elements cont. l'opin. com. chap. 4.*

Descartes luckily appear'd in the time when all Men of Learning and Parts, were longing to have a better Philosophy than that of *Aristotle*, which cannot be made use of, if we desire to Philosophize aright on Natural Things. His Writings were received in the World, as even the most excellent things generally are, when they are new. They found powerful Applauders, and eminent Opposers. He unbarr'd the Gates to Philosophical Liberty. He invented good, and collected excellent things. His Works are read with great profit. All his Opinions nevertheless are not receiv'd by his most zealous Admirers. Some of them are certainly False; and so far he deserves no more Quarter than *Aristotle*. The natural Liberty which all Men have to play the Philosophers, ought to be employ'd only to arrive

at Truth. I make not use of his three Elements to explain the Effects of Nature ; but have long since made choice of the *Corpuscular* Philosophy, because it is the most Antient that ever appear'd in the World ; as I have shewn elsewhere, speaking of the *Phœnician Moschus* ; who, I observ'd, borrow'd from the *Hebrews* this Philosophy of *Corpuscles* and of *Pores*, which he taught in *Greece*, says *Strabo*, before any *Greek* had ever thought of Philosophizing on Natural things. 'Tis certain, that by the Doctrine of the *Pores*, and of the motion of *Corpuscles*, we are enabled to understand in some degree most of the obscurest Points of Physicks. We must not flatter our selves that we shall be able to demonstrate all of them. Nature has its Miracles, as well as Grace : God is to be ador'd in all things. He is incomprehensible in his ways, when he pleases not to manifest them. 'Tis Pride and Vanity to attribute to the Devil, or to regard as Fabulous, what we comprehend not in the Prodigies of Nature. But it cannot be doubted but that the Doctrine of *Pores* and *Corpuscles*, is the most proper to discover the hidden Causes of many surprizing Effects, where the *Peripatetick* Principles can be of no help to us.

This Philosophy is not only more Ancient than all the Philosophers of *Greece*, whither 'twas brought by *Moschus* before the Siege of *Troy* ; but even *Empedocles* himself embrac'd it. For so *Plato* in his Dialogue entitul'd *Menon*, or of *Truth*, makes *Socrates* say. Are there not according to *Empedocles*, Emanations of *Corpuscles*, that loosen themselves

from Bodies? Are there not likewise Pores, or little Apertures, through which, and into which these Corpuscles insinuate themselves and pass? And of these Corpuscles, are there not some proportionable to these Pores, and others larger, or less? *Nonne defluxus quidam secundum Empedoclem, a rebus manare dicuntur? Ac Pori, id est, Meatus, in quos & per quos etiam defluxus ejusmodi manant? Ex defluxibus autem quosdam poris quibusdam congruere, quosdam minores, aut majores esse?*

Pliny also holds the Doctrine of Pores and Corpuscles, which he ascribes to *Plato*, and makes use of it to explain the several Sensations, which favours imprint on the Organs of the Senses. There are, says he, according to *Plato*, infinite numbers of small subtle Bodies, of different Figures, light, rough, round and branch'd; and that agree among themselves more or less, according to their Natures. And this is the reason that bitter and sweet things are not alike so to all the World. *Est & ratio subtilitatis immensa a Platone descendens: corpusculis rerum levibus, scabris, angulosis, rotundis, magis aut minus, ad aliorum naturam accedentibus: ideo non eadem omnibus amara, aut dulcia esse.* Hist. Nat. lib. 22. c. 24.

Plutarch, in his Philosophical Questions plainly demonstrates, how proper the Doctrine of Pores and Corpuscles is to find out the Reasons of natural Effects. We need only read the third Book of his *Symposiana*, to be convinc'd how ready he was at this Philosophy. He says after *Empedocles*, that the reason

reason why some Trees preserve their Leaves in Winter, is because the due proportion there is between the Pores of such Trees and the Corpuscles of the nourishing Juice, makes them penetrate and mount into the Leaves in Winter, as they do in Summer: and that the reason why some Trees are stript of their Leaves, is because they have Pores, that are too large above to retain the nutritious Corpuscles, and too strait below to suffer a sufficient quantity of them to pass, The Corpuscular Philosophy was never better imploy'd. One would think that *Boyle* were speaking. In a Word, *Plutarch* in the same Book fully explains several Effects of Nature, by the help only of *Pores* and of *Corpuscles*, which I have several Years regarded as the two Keys of all the Mechanics of Nature. This Philosophy was brought into *Greece*, by *Moschus* a *Phœnician*. There is therefore all the likelihood in the World, that this so sound a Doctrine came from the *Hebrews* to the *Phœnicians*, and that from them it passed to the *Greeks*. Thus it had illustrious Patrons.

Now that none may doubt of the particular esteem I have for the Philosophy of Pores and Corpuscles, I will make use of the very Terms of *Hannemannus*, in which I find nothing but what is very agreeable to my Sentiments. To explain, says he the admirable Virtues of Plants, I will make use of the *Corpuscular Philosophy*: for indeed, without the help of it, we cannot dive into the Mysteries of this Part of Physicks, no, not with all the *Equipage of Substantial Forms and*
of

of Qualities. That Refuge we will leave to the Ignorant. And he who pretends to Philosophize on those wretched Principles, is no wiser than a Man, who puts to Sea without the least Knowledge of the Use of the Compass, and of the other Tackle, requisite for the great Voyage he undertakes. *Idem ille facit ac aliquis nauta, qui amplissimum Oceanum ingreditur, sine cognitione usus Pixidis nauticae, & necessariorum requisitorum ad tantam Navigationem.* Method. cognosc. simp. Vegetab. pag. 89.

C H A P. XI.

Secrets to make Plants, Flowers and Fruits, larger and more beautiful: together with several Practises, no less curious than useful to Gardening.

I Pretend not here to form a regular Parterre, which contains a Compartment of several Figures, symmetrically dispos'd; and where we see the Flowers artfully plac'd. We will mingle together Herbs, Plants, Shrubs, Flowers and Trees, and this Confusion is the most agreeable Spectacle that we can present our Reader with in this Chapter; which shall be like a sort of Herbal, in which no other Order is observ'd in the Description of the Plants, than that which Hazard and Chance have given it. We will
place

will place no otherwise the several Secrets, which we intend to give in this Chapter; but put them as they shall offer themselves to us.

I. To make Gilliflowers double; and of several Colours.

Ray values this Receipt, because it comes from *Laurembergius*, who is an Author that may be credited. He had some white Gilliflowers, which in the Spring bore all of them single Flowers. He transplanted them in Autumn, and in the Spring following, and kept them from blowing. In the Summer they produced double Flowers, which proving all to be white, he took the following Method to have some of different Colours. He sow'd some of the Seed in a very succulent Earth, which he had caus'd to be dry'd in the Sun, and then sifted through a Sieve. Every Morning and Evening he water'd it with Water of several Colours. On some of the Seeds he pour'd Yellow Water, on others Blue; here Red, there Green, &c. He continued to water them for three Weeks; and every Evening took the Pots into the House, that the Dew of the Night might not dilute and weaken the Colours, with which he had tinctur'd the Water. It succeeded according to his Desire. The Sprouts of the Seed impregnated themselves with the Colours he had made use of; and the Plants bore Gilliflowers of beautiful Colours. Some were of a Saffron-Colour, some White, some Purple, some variegated with divers Colours, &c. Ray
Hist. Plant. Lib. 1. cap. 20.

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The Colours you use to tincture the Water must be taken from Vegetables, for those that come from Minerals are too corrosive, and will kill the Plants.

This Secret may be practised on all sorts of white Flowers. I fancy it would produce a wonderful Effect on white Lillies.

II. *Several very curious Secrets for Gardening.*

I will under this Article set down several Secrets, which a Foreigner of Quality was pleased to give me: and of which he had made several Experiments in his own Gardens,

1. If we graft Jessemin on an Orange-tree, the Flowers will be the stronger, and their Smell will have something of both.

2. If we graft the *Spanish* Jessemin twice or thrice on *Spanish* Broom, the Flowers of the Jessemin will grow yellow.

3. To have Fruits that will purge, we take out of the Earth a little Tree, for example, an Apple-tree. We cut off the biggest Root, and draw out as much of the Pith that is in the Stem, as possibly we can, and having put Rhubarb in the Place of it, we re-plant the Tree, and the Fruits it bears will have a Cathartick Quality. If we will, we cleave the Stem to draw out the Pith; then joyning the Cleft, we wrap it up with Cow-dung, and Vine-leaves over it, and bind the whole with Osier. 32

4. To make a Vine bear Grapes of several Kinds; we take two Branches and notch them a little in the middle, then joyn them together at the place where they are notch'd, and

and binding them hard with Tow, we leave them in that manner till the two Branches are inseparably united together. This new Vine will produce Grapes of several Kinds. If we graft a third sort of Grape on this Vine, the Curiosity will be the greater, and more pleasing to the Sight.

5. We do the same thing with an Iron Pipe of half a Foot long. We draw thro' it four or five Twigs of Vines, having pull'd off the Bark at the Place, where they are to joyn together all in a Body; we bind them very hard, and fill up the void spaces of the Pipe with good Clay: and even cover it entirely, till all the Twigs make but one Vine. It will bear as many sorts of Grapes, as there are Branches of different Vines.

6. If a like Iron Pipe, whose hollow were very small, were fill'd with different Seeds; tis believe that when they come to sprout, the several Plumes, that are very tender coming to meet and squeeze themselves at the little hole of the Pipe, would form but one monstrous Plant, that is to say, that would contain several Kinds wholly different from one another.

7. A Peach-tree, grafted four Times on a Sweet Almond-Tree, bears Peaches whose Kernel is Sweet.

8. Melon-seed, steep'd some Hours in Vine, produces vinous Melons. In our Country we have the Patience to open each seed lengthways at the little end of it where the sprout is to come out, and then lay it to macerate in melted Sugar, perfum'd with Amber-grice: after which we dry it in the Sun, then

then sow it in an Earth well dung'd with Goats-Dung. The Melons will have an admirable Taste, and be larger than ordinary.

9. The Seed of the middle of the Melon produces Melons that are large and round. The Seed taken from the side of the Melon that touch'd the Earth produces Melons that are sweet and more vinous. The Seed next the stalk bears Melons that are long and good for little. And lastly the Seed next the End where grew the Flower bears Melons sizeable enough and well shap'd

10. To have Figs ripe a month before the Season, we chuse out Branches that have most Fruit, the soundest and forwardest of any on the Tree: we prick these Branches slightly with a Pen-knife, half a foot below the Fruit. Beneath which Place we fasten a Piece of Parchment in the shape of a Horn, four inches long, and fill it with Pigeons Dung, diluted with Oyl of Olives: we cover the whole with a piece of Linnen, which we bind round it with Ozier. We put on each Fig a drop of the same Oyl, and continue to do so every four or five days. By this means we shall have delicious Figs, ripe a Month sooner than ordinary.

III. To make a barren-Tree bear Fruit.

Open the Earth at the Foot of the Tree: cut the Ends of the great Roots; take off the Roots that are too long, and stragling, and all the little Roots that are near the Stem. Throw some good new Earth into the Hole, and cover the Roots with it very exactly. Do this, and the Tree will soon give signs of its Vigour. *Philosoph. Transact. April 1669.*

IV. To render the Fruits of a Tree more delicious.

The best way is to bore a Hole in the Trunk of the Tree near the Root, and to fill up the Hole with the Sap of the same Tree, in which you have first infus'd some sweet and odoriferous Matter. *Philosoph. Transact. Feb. 1668.*

V. The best Method to plant Trees.

It has been observ'd, that when the Rain penetrates not to the very Roots of the Trees, and that we take not care to supply that want by Waterings, or by conveying some Stream thither, we soon see such Trees die away. Take Care therefore that the Water may reach to the Ends of the Roots. To this end, plant not the Trees too deep, nor the Roots lower than the good Earth: but plant your Trees in such a manner, that the Water and the Heat of the Sun may gently provoke the Roots to do their Duty. They cannot be too near the surface of the Earth, were it not for the too great Heats and Droughts of Summer, which devour the Moisture of the Earth, and burn and dry up the Roots to death. *Philosoph. Transact. February. 1669.*

VI. To hasten the Germination of Seeds.

Steep a Bean nine Days in Oil of Olives, 'twill sprout in two Hours, if you stick it into the crummy part of a hot Loaf. This is wonderful, says *Cardanus*, but of little use. *Hæc mira, parum tamen utilia.* He adds very well, that in Countries where Men are ingenious it may be of great Advantage, seeing it may open the way to greater Discoveries. *De Varietat. Lib. 13. Cap. 66.* I cannot

cannot forbear to observe, that *Cardanus* has couch'd this Receipt in a Chapter, whose Title is, *The Delights*. He is much in the right, if he mean, as no doubt he does, *the Delights of the Mind*. 'Tis charming to behold these innocent Artifices, which the Industry of Men make use of, to discover what may be expected from nature.

VII. *To give Fruits a Medicinal Virtue.*

Kircherus says, we must make choice of a young and vigorous tree. 'Tis best it should be expos'd to the clear Air, in a place not shelter'd from the Wind. At the same time when you graft it, if it be a Mulberry-tree, and you graft it with Grafts of an Apple-tree, Pear-tree or Plum-tree, and would have the Fruits have a purgative Virtue, you must bore the Trunk with an Auger, and fill the hole with black Hellebore, reduc'd to Powder, or with Scammony or Coloquintida. But these being violent, we may in their Place put some Sena, some Rhubarb, some Juice of Aloes, or any other cathartick Juice. We put those things very carefully into the Hole we have made in the Trunk, and stop it well, that the Spirits of the Drugs may not exhale. The Hole must not be made in such a manner as to hinder the Communication of the Root with the Top of the Tree. By this Operation we shall have purgative Fruits.

By the same method, if we make use of the Juice of Poppy, of Morel, of Mandrake, of Thorn-Apple, or of Hen-bane, we shall have Fruits of a Narcotick and Soporative Virtue.

If we make use of Cinnamon, Musk, Sugar, or Cloves, the Trees will bear Fruits of a delicious Taste and Smell. *Kirch. de Art. Magnet. Lib. 3. cap. 1.*

VIII. To have Grapes ripe in the Spring.

Graft a Vine on a Cherry Tree; the Grapes which it produces, will be form'd and ripe in the Season of Cherries. But the main affair is to graft a Vine well on a Cherry-stock. The way is this. We bore a Hole with an Awger in the Trunk of the Cherry-Tree. In this Hole we graft the Vine Branch: and let it grow there till it has fill'd the Hole of the Awger, and be closely join'd to the Cherry-Tree. Then we cut off the Vine-Branch from the Vine, after which it will draw all its nourishment from the Cherry-Tree: whose Sap will hasten the Formation and Maturity of the Grapes, which will be ripe two months sooner than ordinary.

IX. To make Celery, and Macedonian Parsly grow very fast.

Tho' Celery-seed grows sooner than some other seeds, yet sometimes 'tis a Month before it comes up. To hasten its Germination observe this method, take this years seed, and steep it a day or two in Vinegar in a Place something warm: when you take it out, lay it a drying, Sow it in good Earth, mixt with Ashes made of the Stalks and Pods of Beans. Water it with Water a little warm, and then cover the Earth with good Straw-Mats, that the Heat may not exhale too soon. In a few days you will see the Earth begin to open. Continue to water it and the stems will soon show themselves, and lengthen. To
Succeed

succeed in this method, you must be very exact in it. *Porta* says, that for want of being so, he could not enjoy the Pleasure of that success, which his more careful and happy Friends tasted in Perfection. *In hoc tamen sedulâ manûs operatione opus est: & si probaverim, ut votum erat, non successit: amicis vere periclitantibus felicissime.* Mag. Nat. Lib. 3. cap. 8.

X. To make Cabbages pome the sooner.

The Curious, when they transplant their Cabbages, put Sea-weed, with a pinch of Nitre under each Root: This makes them thrive and pome to admiration.

They who observe the same method, when they remove their Lettuce or their Succory, have Cabbage-Lettuce as big as ones Head, and Succory of a monstrous size. Even the taste of them is more delicious.

XI. To make Lettuce come up in less than two hours. —

M. Edmund Wyld, an English Gentleman, having invited some Persons to dinner, sow'd in their Presence, before they sat down to Table, some Lettuce seed, in an Earth which he had been preparing two years together. And after Dinner, in less than two hours, they found that the Lettuce had sprouted to about the Length of a Inch, taking in Root and all. He offers to lay ten to one that the same thing will succeed always, provided he have two years allow'd to prepare fresh Earth. He adds that this Experiment is the Key of all Agriculture. He promises to make it publick, when he has brought another thing to bear, yet more considerable, and which he intends to joyn with it. *Boyle Republ. des Lett. Mar. 1685.* XII

XII. *To have Strawberries earlier then usual.*

Water the Strawberries every three Days with water, in which some Horse Dung has been steep'd. We mend the Ground, says Bacon with Dung: all the World knows this: but 'twere well they knew likewise, how efficacious Water is, when it has been fatten'd and heated by Dung, to advance the Vegetation of Plants, and the Maturity of Fruits.

Cent. 5. N. 403.

XIII. *To have Roses very late.*

The Pleasure is as great to have backward Flowers, as to have them early, the Ancients set a great value on Roses that blew about the end of Autumn. The weakness of the Sun in that Season, makes us believe, we are not then to expect any thing fine from Nature; nevertheless there are several ways to succeed in it. The following Experiments are attested by Bacon.

1. If in the Spring you cut off the Branches that seem likely to bear Roses, the Shoots will produce some in the Month of November. The reason is, because the Juice that would have been conveyed to the principal Branches, goes to the Shoots, hastens them, and makes them bear the Roses which Nature reserv'd for the following Spring. Cent. 5. n. 413.

2. If you pull off the Buds of Rose-bushes, at the time when they begin to unfold, you will see new Shoots spring out on the sides, and these Shoots will blow very late. The Course of the nourishing Juice being suspended and turn'd aside, it takes another and conveys it self to the Eyes and But-

tons that were not to have come out till the Year following. *Cent. 5. n. 414.*

3. We cut off all the old Branches, and leave only those that are of the last Year, and which ought not to bear Roses till next. All the Aliment conveys it self to these young Branches, and makes them bear Flowers in Autumn, which they should not have born till the Spring following. *Cent. 5. n. 415.*

4. You need only uncover the Roots of the Rose-Bush about Christmas for some days. This hinders the Juice from mounting from the Root to the top of the Plant; the Vegetation is retarded and interrupted. It begins afresh, as soon as you throw again the Earth upon the Roots, but the Leaves and Flowers come later. *Cent. 5. n. 416.*

5. Pull up a Rose-bush for some Weeks before the Buds appear. When you replant it, the Juice will be some time e'er it retake its Course through the Pores of the Roots, which retards the coming of the Flowers.

6. Plant a Rose-bush in a very shady place, as under a Hedge. From thence two things arrive. 1. The Plant is not warm'd by the Sun, whose Heat hastens the motion of the Sap. 2. The Hedge draws to it self most of the Juices of the Earth, and leaves but little to the Plants its Neighbours, and these two Causes joyn'd together, considerably retard the Vegetation of the Rose-bush, which must of necessity yield Roses much the later. *Cent. 5. n. 420.*

To this we will add with *Bacon*, that all we have said of the Rose-bush, may be applied to other Flow'ring Plants, *mutatis mutandis*.

XIV. To plant a Wood at a small Expence, that will soon cast an agreeable Shade.

For this purpose make choice of the Trees, that easily shoot out Roots; as Willows, Oziers, the Poplar, the Alder. Lay Branches of them, their full Length into the Earth: At all their Knots there will come out Shoots, that will make as many Trees. *Cent.*

5. 425.

XV. To make barren Trees bear Fruit.

There are some Trees charming to look on, which nevertheless bear no Fruit; the reason whereof certainly is the too great abundance of the Sap. These barren Trees must be pierc'd with an Awger in the Trunk even to the Pith. Part of the Sap as it mounts, turns aside and evacuates by this Aperture, which makes the Tree fruitful.

Cent. 5. n. 428. This is a wholesome Bleeding.

XVI. To make the Seeds, Kernels and Stones of Fruits come up speedily.

Take some Kernels of Apples, Pears and Oranges; and some Stones of Peaches, Abricots, and Plums: and put them into the Onion, which we call *Squilla Marina*, or if you will into a large common Onion. Put them into good Earth, and be assur'd, that being excited by the Moisture and by the Heat of the Onion, they will sprout the sooner. This is as it were a manner of Grafting: The Graft derives its nourishment

from the Trunk on which 'tis Grafted. This Experiment might be carried farther, and 'tis likely that if we put the Seeds of Onion, into an Onion it self, the Seed would come up the sooner, and bear an Onion larger and better nourish'd. 'Tis natural to imagine, that Seeds serv'd in this manner, will find more nourishment than in the bare Earth.

XVII. To have early Cowcumbers.

We know by Experience, that if we cut close to the Ground, the Stalks of Cowcumbers, some days after their Germination, and throw Earth upon them, the Plant will not appear till the Spring after, when it blossoms and yields much more Fruit than usual.

Bacon is of opinion, that the reason why Annual Plants out-live not the Winter, but die at the end of Autumn, is because they have exhausted all their Juice in the Production of their Leaves and Fruits : and that by preventing this Dissipation, they would preserve themselves for the Year following; provided always that we protect them from the excessive Cold.

XVIII. To give Flowers what Colours we please.

In regard to Plants, whose Stem and Branches are strong, we pierce them to the very Pith : and work into the Aperture, the Colours we would give the Flower : and then cover up the hole with Cow-dung or with Clay; and the Flowers will have as many different Colours, as we put in forts.

It should be observed that the Virtue or Impression of these borrow'd Colours, will last but for that Year: and that the Plant will leave these false Colours, to give the Flowers those that are natural to them. There are some who say 'tis good to water the Earth at the foot of the Plant with the same Colours we put into the Aperture of the Stem.

By the same method we may give to Flowers extraordinary Scents, by putting in Musk, &c.

The same thing may be practic'd in regard to Fruits; and we may imbibe them, if we will, with a Medicinal, Purgative Power, or a sweet and sugary Quality, by insinuating into the Aperture, made in the Trunk or Branches, Treacle, Rhubarb, Sugar, Honey, or any other thing, of which we desire the Fruits should have a Flavour.

But we must be very careful that what we put in, whether Colour, or Odoriferous, or Medicinal Drug, be not Mineral, because of its corrosive Quality, which would kill the Plant.

As for Colours, Lake is good, and all the Colours that are expressed out of macerated Flowers, as from Violets, &c.

In regard to what we sow, if we steep the Seed in Sack, or in Wine mixt with Honey, in Milk, or even in Water, in which we have put Sugar, or any odoriferous things, the Fruits will be much more delicate, and as it were, all perfum'd. This the Curious, and Men of good Palates, seldom fail to do in regard to Melons.

XIX. *To give Fruits what Figure we please.*

Make a Mould of Clay, within which there must be the Figure you would give to an Apple, a Pear, or a Peach. Let the Mould be of two or three Pieces, as they are generally made to cast Figures in Wax; lay it before the Fire to harden a little: then put the Fruit, while 'tis yet small, into the Mould; and for fear it should open, bind it hard, and keep it close in this manner, till the Fruit have fill'd all its vacancy. Nothing is more pleasant, than to see after this an Apple, that represents very regularly, the Face, or the Head of an Animal. Above all we find that this trifling sport succeeds perfectly well, when we make the Experiment on Citruls.

XX. *The Virtue of Ashes in rendring Plants and Flowers larger and more beautiful.*

To make a Plant grow to an extraordinary size, water it sometimes with Lye, made with Ashes of the like Plants. 'Tis certain, that the Salts, that are in such a Lye, contribute very much to the abundantly supplying the Plants with what is requisite to their Vegetation: especially such, as these Salts have any Analogy with, by their Configuration. For 'tis most certain, that the Salts taken from the Ashes of burnt Tulips, holding more proportion with the disposition of the Parts which compose the Bulb, the Stem, the Leaves, and the Flower of the Tulip, are much more proper to make it grow to an extraordinary size, than the Salts of Plants of another kind.

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This gives me occasion to take notice by the way, that our Farmers burn indifferently Fern, Nettles, Juniper, Brambles, &c. to spread the Ashes on their Land, and think by so doing to increase its Fertility. The Question is, to know whether those Salts that are of a quite different Nature and Figure, from those of the Seeds with which we have sown our Field, can contribute to their Vegetation and Multiplication.

XXI. *To render Fruits more delicious and earlier ripe.*

'Tis said that to hasten the Maturity of Fruits, and to make them more agreeable to the Taste, we need only pierce the Trunk of the Tree, and thrust into the Hole a Peg, made of some Wood, whose Tree is of a hotter Quality. Such are the Turpentine-tree, the Maltick, Guajacum, Juniper, &c. A Mulberry-tree becomes more fruitful by this method, and the Mulberries excellently good, besides that their Pre-maturity is very desirable.

XXII. *How to work Wonders in the Culture of Flowers.*

We are now going to rifle *Ferrari's Flora*. The Booty will be rich and good. *Andreas Capranica*, in an Academical Discourse pronounced at *Rome*, says; That if we apply to Plants, the Helps we may take from Chymistry, Art will force Nature to out-do even her self. She will do more than she ever has done. The whole depends on the right and ingenious Use of Mercury, of Salt, and of the Sulphur of Philosophers. What miraculous Flowers should we not have, if we knew

knew how to mingle the warm Blood of Animals in the Juices of the Earth? The Value of that Blood is not known; except only the Blood of Goats; which because of its exceeding Dryness, is less proper for Vegetation. If with the Blood we mix some Ashes and some Salts of Plants, or some Nitre, which is of it self so fruitful, we shall have Flowers that will be surprizingly large. A Dunghill well chosen, and rightly imploy'd, is of wondrous Efficacy to forward the Flowers, and to give them a charming Enamel. And we should bring this great Work to perfection, if we knew how to macerate all these things in Brandy, and to extract the Quintessence by Distillation. We should see such Wonders as would surpass our Comprehension, and we should take them to be Dreams.

We must take care that these scorching matters touch not the Roots of the Plants. There must be good Earth above, upon which, without doing any prejudice to the Roots, we may pour this Balm of Life with Prudence, and in due proportion.

In *Tuscany* there is a Gardiner of Merit, who found the Secret to keep ten Years in a great Glass Bason, fill'd with Earth, a Branch of an Apple-tree, hung with three or four Apples: nor could the least Decay be perceived either in the Fruit or Branch. Might not the same Secret be made use of for the preservation of Flowers?

Nothing is more comfortable to Plants than to water them with Water warm'd in the Sun; and in which has been put some Pigeons

Pigeons Dung, and Ashes of Plants of the same kind. *Ferrari Flora lib. 4. cap. 3.*

XXIII. To change and fix the Time when Flowers shall blow.

'Tis impossible to retard or advance the time of Flowers just as we please. We may by Art anticipate on the usual Season; and Roses, for Example, that generally blow at the end of the Spring, shall appear much sooner.

1. Plant a Rose-tree at the end of October, in a Pot fill'd with good Earth, mixt with a succulent and rotten Dung. Water it twice every day with a little warm Water. In cold and frosty Weather take it in a Doors, and never let it be abroad in the Night. Towards the Spring, when mild Zephyrus returns with the Heat of the Sun, to court the Plants to put on their green Attire, you must water the Rose-tree with Water a little warmer: Do this, and you shall see with what Diligence the Roses will appear to welcome in the first Days of the Spring.

There is one inconvenience, says *Ferrari*, which is, that so premature a Birth often makes the Mother die almost at the same time with the Infant. This Method nevertheless is much boasted of by the Ancients who have treated of Gardening. *Plin. Hist. Nat. lib. 21. cap. 4.*

2. You may have this satisfaction at an easier rate, by inoculating an Eye, taken from a Rose-tree Branch, on an Almond Stock. You may be assured of having very fine Roses; and

and that too sometimes even when the Earth is yet cover'd with Frost and Snow.

3. If after the manner of the Ancient Romans, you desire to have the Flower that has the Sovereignty over all other Flowers, by the first of *January*, the Day on which the Consuls put on their Consular Purple; you must, says *Democritus*, during the excessive Heats of the Summer, water twice a day the Rose-tree which you design should afford you this satisfaction, 'twill blow in the depth of Winter. But I believe that when the great Colds come, it must be taken into the Green-house.

4. The Flowers that blow only in the Spring and in Summer, will appear in the Winter, if we put them forward by fat, warm and subtile Nourishments. The *Marc* of Grapes, when all the little Skins are pick'd out, the *Marc* of Olives, Horse-dung, and Kennel-Water, contribute beyond belief to the forwarding of Plants. Thus if at the beginning of *October* you cut off the two forward Branches of Gilliflowers, and bury them with some fat and saline Matter at the foot of the Plant, your Gilliflowers will blow four Months the sooner.

5. The whole Secret of having early Flowers, says *Cardanus* from whom *Ferrari* has taken it, consists in four things. 1. The Bourgeon must be warm'd and encourag'd not to unfold it self too late. 2. The Plants must be kept in a warm place. 3. They must have a succulent Nourishment. 4. This Nourishment must be proper for the Plant, on which you make the Experiment.

I am never weary, adds *Cardanus*, of recommending these four things, which are grounded upon Reason. *De Varietat. Lib. 12. cap. 66.*

6. 'Tis a way that never fails, to put Seeds into Onions : for the Heat of the Onion excites and wonderfully hastens the Germination. This method is made use of with much success, for the Seeds and Kernels which generally sprout with difficulty.

7. To have Roses in Winter, you must pull up the Rose-trees, when they begin to Bud, and transplant them into a leaner Soil : This retards them extremely : for then their first care is to nourish themselves, and to extend their Roots ; and till they have done so, they cannot determine to bring forth the Flowers, that should have blown in the Spring.

8. *Ferrari* relates after *Porta*, that if a dextrous Hand inoculates a Rose-tree Bud upon an Apple-Stock, the Tree will bear at the same time, about the end of *September*, the Flowers of the Spring, and the Fruits of Autumn.

9. This Secret is not extraordinary, but deserves to be known. To have Gilliflowers, Pinks, and Roses very late, we have only to bruise gently with our Fingers, the new-born Buds, or the Cups, that contain the Flower. The Plant must be water'd very much during the Heats of the Summer. By this little Artifice we keep back in the Stem, the Moisture designed by Nature for the perfect formation of the Flower : but it grows warm, and retakes its motion, that
it

it may produce other Flowers. We serve little Birds the same trick. If we destroy their Nest while they are brooding on their Eggs, they make a new Nest, and lay new Eggs, in the room of those we took from them: and by this means we make them have young ones a Month later.

10. If we plant the Bulbs of Lillies very deep in the Earth, they will blow the later. Thus to have the Flowers the longer, we set some of the Bulbs three Inches in the Ground, some five, and others seven.

A Lilly will keep much longer, if before it be blown, we enclose it exactly between two earthen Pots, that are not varnish'd. In two Months afterwards we release it from that Prison, as it were to salute the Light, and do Homage to the Sun, 'twill blow with all the diligence that can be desired. The like may be done in regard to other Flowers. Pinks and Anemones may be kept a great while in this manner, if between the two Pots of Earth, we put some green Plants of Oats, Roots and all. We may cover the Cup of a Pink with Flax, do it over with Pitch, and then put it into the Hollow of a Cane, or into a Box made of the Wood of Oak, done over with Pitch likewise, lest the Air and the Humidity should get in: and in this condition lay the whole in an Earth that is not too moist. These Hints are enough to form in us an Idea of doing even better than all this.

XXIV. *How to have Flowers in Winter, and Fruits in the Spring.*

All consists in having two things. First, whether the Vegetation of Plants depends so entirely on the Action of the Sun, as never to dispence with the want of it. To which 'tis easie to answer: that every other cause, which is capable of warming and putting into motion the Juices of the Earth, is likewise capable of producing the same effects. The second thing to be known is ; what is the cause whose Action may be substituted instead of the Operation of the Sun. Gardiners generally make use of Dung and of Lime, to warm the Foot of their Trees during the Winter, and to make them shoot early in the Spring. Some keep Fires in Subterranean Places, to warm the Air and the Earth, and to produce a wonderful variety of Flowers, even during the severest Frost of the Year. Thus *Albertus Magnus*, by his great Knowledge in the Nature of Plants, made the Spring appear in the Winter, and Autumn in the Spring.

But it being difficult to imitate exactly the different Degrees of the Heat of the Sun, it often happens that we surpass them in our Operations, and give an over-violent motion to the Juices of the Earth: hence it is that they mount with too much Precipitation from the Roots into the Branches, to coagulate themselves there; and that the Pores of the Branches, thro' which they pass so quick, widen themselves to such a degree, as not to be any longer capable of retaining any Nourishment. For this reason, the Trees that are forc'd to bear early Fruits never live long: but grow dry and die

die away as soon as they have produc'd their first Fruits.

XXV. *To give new Colours to Flowers.*

There are particularly three Colours, that are rare in Flowers, and which the Curious are desirous to introduce among them. *Black*, whose lugubrious Hue is so proper to paint the Havock that Death makes in Families. *Green* so Delightful to the Eyes, and that nourishes and strengthens the Sight. *Blue*, that transmits to Earth the Colour of the Heavens.

1. We may make Flowers take these three sorts of Colours without much trouble: For *Black*, we make use of the little Fruits that grow upon Alders, keeping them till they are very dry, and then reducing them to impalpable Powder: For *Green*, we take the Juice of Rue: And for *Blue*, the Blue-Bottles that grow amongst Corn. We dry them and reduce them likewise to a very fine Powder: then use them as follows.

We take the Colour with which we would impregnate a Plant, and mingle it with Sheeps-Dung, a little Vinegar, and a little Salt. The Colour must make up one third of the Composition. We lay this Matter, which ought to be of the Consistency of Paste, on the Root of a Plant, whose Flowers are White. We water it with some Water, a little tinctur'd with the same Colour, and do nothing else to it but what is usual. Thus we have the pleasure to see Pinks that were White, change to be as Black as *Ethiops*. We do the like for the Green and the Blue.

To succeed the better, we prepare the Earth. We chuse one that is light and very fat, dry it in the Sun, reduce it into Powder, and then sift it. We fill a Pot with it, and set in the middle a white Gilliflower. For White is the only Colour that is tractable, and will take these Tinctures. No Rain nor Nightly Dews must fall upon this Plant: and in the Day it must be set in the Sun.

If we would have this white Flower cloath it self in Regal Purple, we make use of *Brass* Wood, to make the Paste, and to tincture the Water for the Irrigations. By this Artifice we might have charming Lillies. By watering the Plant with three or four Colours, in as many different Places, we should have Lillies of several Colours, that would be beautiful to admiration.

The Curious lay their Tulip Bulbs to macerate in prepar'd Liquors, whose Dies they will then take. Some notch these Bulbs a little, and work in dry Colours into the little Notches.

XXVI. *To give new Odours to Flowers.*

Beauty is but a vain Ornament if it be not accompanied with the sweet Odour of a good Name. This holds true in some measure in regard to Flowers. Of what use are their lively enamel'd Colours, that please the Eye, if they diffuse around an insupportable Smell? We should therefore work a Miracle, and at the same time do a good Office to a Flower, if we take from it its ill Odour, and give it a good one. Peonies and Tulips are charming to the Sight, but

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terribly offensive to the Smell. Let Art then give what Nature has refus'd them.

1. The Method is almost the same, to imprint new Colours on Flowers, as to perfume them with an Odour that is not natural to them. We may begin to remedy the ill Smell of a Plant, even before its Birth, that is to say, when we sow it, if it come from Seed. We steep some Sheeps-Dung in Vinegar, and put to it a little Musk, Civet, or Amber-grise in Powder. We lay the Seeds, or even the Bulbs to macerate some Days in this Liquor. 'Tis known by Experience that the Flowers which come from them, will diffuse a most sweet and delicious Odour. If we would be sure not to fail, we must water the new-born Plants with the same Liquor in which we steep'd the Seeds.

Ferrari adds, that a Friend of his undertook to take from the *African* Marygold its offensive smell, and that he succeeded with a little Care. He steep'd the Seeds for two days in Rose-water, in which he had infus'd a little Musk. He let them dry a little, and then sow'd them. The Flowers did not intirely lose their nauseous Scent. However, a sweetness was found to breath from amidst their natural Smell, which made that Defect be supported with some pleasure. He sow'd the Seeds of these Plants, that were already a little mended, with the same preparation as before, and they produc'd Flowers that might vie in sweetness with Jessamins and Violets. Thus, of a Flower, which before was the pleasure of one Sence,
and

and the Aversion of another, he wrought a Miracle, that charm'd alike at once both the Sight and the Smell.

2. In regard to Plants, that proceed from Roots, Slips, or Layers, the Operation is perform'd at the Foot, as we said when we were speaking of Colours. 'Tis all the same thing.

As to Trees, we bore their Trunk with an Awgor; and before the Sap rises, put into the Hole the Matter, having first brought it to the consistency of Honey, of which we would have the Fruits take the Odour and Taste.

Thus I have given the Principles, which, I doubt not, will supply the Ingenious with a thousand Idea's, that will easily arise from these Hints, and enable them to go infinitely beyond them. These very Rules carried into the Kitchen-Garden, and apply'd to leguminous Plants, will make them more wholesome and more delicious. We may impart to them what Virtues we please. We may make them Purgative and Medicinal. We may make Prodigies of them: and such too as shall not be meerly Curious. Health and Life the two most precious things we Mortals enjoy, will find a great Relief by it. History informs us, that *Attalus*, King of *Pergamas*, cultivated, out of meer Malice, the Poysonous Plants, that brought infallible Death: And we out of good Nature will cultivate the wholesome and vivifying Plants, and endeavour by such as are Medicinal, to relieve the Sick, and by sweet and delicious Legumes to please the Taste of all Men.

After all let us remember, that Art does not all it would, nor in the manner it would; but must govern it self by the Mechanicks of Nature: It must be subject to her Laws, because they are the Laws of the Author of Nature. *Ferrari*, from whom I have borrow'd these three Articles, has compos'd an admirable Discourse, that contains a learned Dispute between Nature and Art. Wit and Elegance reign throughout the whole Treatise, which he judiciously concludes by this excellent Saying: *Hic Florei Duelli finis: hoc documentum, infelicitèr pugnare Artem, cum repugnat Natura.* Flora lib. 4. cap. 6.

XXVII. *How to have rich Harvests, and plentiful Vintages.*

'Tis *Porta*, from whom I have taken this charming Secret, with which I intend to conclude these Receipts for the Vegetation of Plants. He is of Opinion, that nothing can be comparable to it, for the Plants we call Leguminous. This Affair, says he, is of an immense Advantage, one Bushel of Corn will produce above a hundred. But take notice, that the increase will not be so great, if the Year, the Weather, the Earth, and the Seasons be so much out of Tune, that all Nature were to suffer by it. The Crop however will be large, tho' less than I mentioned: but if the Season be kindly, one Bushel will certainly yield a hundred and fifty. This will not seem a Paradox, if we call to mind, that the Governour of *Bizacium*, a Region of *Africa*, sent *Nero* a Plant of Wheat, of three hundred and forty Stalks, that all came from one single Grain. 'Tis certain that
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most Husband-men know nothing of their Profession; which is the reason that in this Country we seldom have good Crops. But I will shew them the way, to make their Lands produce Crops, worthy of their Labours, and answerable to their Desires.

The METHOD.

The Bride must be led to the Bridegroom: she must not be chosen from the Top, nor from the Bottom, but from the Middle. All that are taken elsewhere have no strength. She must be separated by the Bath: Then having perfum'd her with Essence, and fatten'd her with the Grease of old Goats, we associate her to Vulcan and Bacchus. We warm a Down Bed to lay her at her Ease: for 'tis the vivifying Heat, that makes them begin to cleave together with Affection, and to clasp and enfold each other with tender Embraces. The Seed thus animated will produce a powerful and numerous Posterity. The Moon with her fruitful Light must preside over them: for whatever is fruitful imparts its Fertility. I have only this farther caution to give, that Bacchus must have a Wife that has not lost her Hair: because a Woman, whose Head is thus depriv'd of its Ornament, is despis'd by her Husband: nor would she have wherewith to get rid of hurtful Things. 'Tis enough only that her Hair be not frizzled. Being thus less trick'd up, she will be more pleasing to her Spouse.

This cannot be understood without a Comment. I cannot tell why *Porta*, who all along endeavour'd to be understood, affects

to be obscure in this Place. This long Allegory of Husband and Wife seems to be ill plac'd. Methinks I discover in it a Glimpse of our second Multiplication, page 121. The Seed-Corn should be chosen from the middle of the Ear. Such as swims on the surface of the Liquor of Multiplication is not good to sow. Fat things and Athes, figur'd by *Vulcan* the God of Fire, enter into the Composition. There must be a little Brandy or Wine, which is signified by *Bacchus*. The Earth too must be prepar'd. We should sow at the Full Moon, and the Corn of the same Year, as it comes out of the Ears. I know no more of it. I hope some Person or another, who is more vers'd in this Enigmatical Style of the Chymists, will give us the Key.

Let us not forget our admirable Secrets for the Multiplication of Corn, for by transporting them from Agriculture to Gardening, we may reasonably expect, especially with Nitre a little qualified, prodigious Plants and Flowers in our Kitchen Gardens, and in our Parterres.

I. OBSERVATION.

Seeing the Culture of Exotick Plants, that they may thrive in our Country, particularly requires a Earth, that has some Relation with that of the *East* and *West-Indies*, from whence they are brought us, 'twill here be requisite to teach the Method of preparing such an Earth. After which there is nothing to be done but to keep them in warm Places,

Places, upon hot Beds, and under Bell-Glasses and Sashes, and where they may be shelter'd from the severity of the Cold.

1. *How to prepare Earth for Exotick Trees.*

Take for Example a hundred pound weight of Mould; of the Leaves fallen from Trees, and a little rotten, fifty Pounds: of Occidental Civet, (for we must speak politely like the Chymists, for fear of giving offence to the Nice) ten Pounds. We leave this to ferment for some time, where the Rain cannot fall upon it: because the Salts of these Matters would be wash'd away by the Water. To this we add two and twenty Pounds of the Lees of Oil of Olives, and fifteen of Quick Lime. This Matter too must ferment two Months; at the end of which, we may very safely lay some of it at the foot of Exotick Trees; and they will then thrive as well as if they were in their own Country, in the nitrous Soils of the East, the South and the West.

2. *How to prepare Earth for Exotick Plants.*

We get ten Pounds of the Leaves of Trees, almost putrified; twenty Pounds of old Cow-Dung; one Pound of the Parings of Horses Hoofs, one Pound of Oil of Olives; enough of white Sand to thicken these Matters; two Pounds of Tartar in Powder; and one Pound of Nitre. We let all this ferment for some Months. With this Earth we fill the Pots or Cases, and the Plants will shoot and blossom to admiration.

II. OBSERVATION.

After all there are some Plants, on which no Culture can work any thing; and whose Vegetation is wholly unaccountable. *Triumfetti* relates, that he put into a Glass Bottle some Seed of *Hippolapathum* or Monks-Rhubarb, to preserve it from the Humidities of the Air, and from the Heat of the Sun; and that it germinated and shot out Roots, without either Earth or Water. There was no great Ceremony in this Vegetation.

But what is yet more wonderful, is the Tree that will not be planted by the Hand of Man. 'Twould die, and the Race of it should fail, rather than it would suffer a Gardener to plant it. 'Tis the Tree that bears the Nutmegs. 'Tis observable of the Nutmeg, says *Tavernier*, that the Tree is never planted: This has been attested to me by several Persons who have resided many Years in the Islands of *Bonda*. I have been assured that when the Nuts are ripe, there come certain Birds from the Islands that lie towards the South, who swallow them down whole, and evacuate them whole likewise, without ever having digested them. These Nuts being then cover'd with a viscus and glutinous Matter, when they fall on the Ground, take Root, vegetate and produce a Tree, which would not grow from them, if they were planted like other Trees. This Tree requires neither Gardener, nor Rules of Gardening.

dening. Nature has its Irregularities, which the Learned call *Anomalies*, and that are above our Reason. *Aristotle* says very wisely, that 'tis want of Wit to inquire into the Reason of them. *Nam rationes querere earum rerum, quae potent sensui, infirmitas quaedam intellectus est.* *Phyfic. Lib. 8.*

CHAP. XII.

Curious Observations concerning Vegetations.

Nature is never idle; and when she is interrupted or thwarted in her Operations, rather than do nothing, she will produce Prodigies and Monsters. This is her frequent practice in the several Races of Minerals, Vegetables and Animals. I should compose a vast Volume, if I collected all the irregular and monstrous Generations, that we find in the Physiologers. But 'tis certain that tho' the Course of Nature be astonishing, in Minerals and in Animals; yet she does much greater things, and more frequently in the Race of Vegetables.

The Naturalists of *Germany* tell us of a monstrous Radish, that represented exactly the Figure of a Man: but this sport of Nature is common in Mandrakes, whose Roots are fashion'd so like a Man, that for that only Reason *Pythagoras* call'd that Plant *ανδρωπομόρον*, that is to say, *Having the Shape*
and

and Figure of a Man. *Francisc. Imperat.* says, that his Father had one, where all the Members were distinctly seen in exact Proportion. I my self have seen one, where this similitude with the Body of a Man was surprizing. It had a sort of Head with long fibrous Roots hanging down, and that form'd a comical Head of Hair. The Body was to be seen with two Arms, and with Thighs and Legs that ended in a point. The Virtue of this Plant is to stupifie and benumn the Senses, and to take away all sensibility. For this Reason a Dose of it is given to those who are to undergo the Amputation of a Limb, or that are sentenc'd to be Tortur'd, says

A. Reies. Hinc illis quibus aliquod membrum excindendum est, aut tortura aliqua subeunda merito propinatur, ut sensuiva virtute sopita, doloris vim non sentiant. Camp. Elys. Quæst.

43. n. 3. This Potion takes away the Sense so effectually, that too much of it is a mortal Poison. If the Dose be too strong, 'twill throw a Man into a Delirium, and make him rave in a terrible manner. The same Author says, that he knew four Country Fellows, who having found a Mandrake in their Garden, took the Leaves of it, thinking it to be a Beet, and put them into the Pot with their Meat. Some hours after they had Din'd, they were seiz'd with a strange Alienation of Mind. One of them could not stand upon his Legs; another run up and down stark naked; the third got up upon the Tiles of the House, and would not come down, because he fancied that Thieves were broke in. The fourth tore all his Flesh with

his Nails. This Frenzy of theirs lasted but one Day, the next they were well again.

If we take but a little of it 'twill make us more gay, more bold and resolute. We are as it were half Drunk. The *Janizaries* among the *Turks* take a little of it before they go to fight.

'Tis a great Question among the Botanists, whether the Mandrake be a remedy against Sterility: Some believe the *Israelites* had that opinion of it, because of what is said in *Genesis*, chap. 30. v. 14. where *Rachel* seems very desirous to have the Mandrakes, that *Reuben* had found in the Field, and brought to his Mother *Leah*. The Scripture does not say, that *Rachel* design'd thereby to deliver her self from the Reproach of Barrenness. 'Tis likely that in *Judea* the Mandrake Apples are beautiful and smell sweet. The Spouse in the *Canticles* invites her Beloved to go out into the Fields, because the *Pomegranates* are in blossom, and the *Mandrakes* diffuse a sweet Odour, Chap. 8. v. 13. Moreover, *A. Reies* proves several ways, that tho' the Juice of Mandrake, taken in a large Quantity, causes Barrenness, and even takes away Life, 'tis nevertheless certain, that being duly made use of, 'tis so far from causing Sterility, that 'tis very proper for the Use, for which *Rachel* is believ'd to have asked her Sister *Leah* for the Mandrakes with so much earnestness.

Sorcerers and Conjurers make sometimes an ill Use of this Plant, which is very dangerous in bad Hands. *Dodoneus* says, that the

the Mandrake is called by the *Greeks* *χίρδα*, because the famous Witch *Circe* made use of it to compose the Philters and Love-Potions, which forced Men to love her. *Creditur enim hujus radix ad amatoria facere.* Dodon. Hist. Stirp. Lib. 4. cap. 29. But the Monntebanks imploy it to a quite different Use: and make of it what we call a *Hand of Glory*. The nearer the Root approaches the Figure of a Man, the more they value it. They keep it in a Box, and sell it very dear to avaritious and credulous Fools, whom they make believe, that by using some little Ceremonies, the Silver they lay near it, will increase to double the Sum every Morning. Thus they bubble those, whom mad and unjust Desires make blind and ridiculous. This has given occasion to another Cheat. They who make a Trade of these Impostures, instead of Mandrakes, which are scarce in *France*, sell the Roots of *Bryony* or of *Snake-weed*, which they cut into the shape of Mandrakes, and sticking them with Oats, lay them fifteen or twenty Days in the Ground, The Oats germinate, and incorporating themselves with the Roots, cover them with Hair like Fibres, and thus compleat the resemblance. *Matthiolum* relates at length all that these Impostors do, to make the Roots of *Bryony* represent a human Shape. Being at *Rome*, there fell under his Hands a sick Person, who made it his Business to cut these Roots into the shape of Men, and who sold them very dear. His Patient reveal'd the whole Secret to him, and confess'd that 'twas scarce credible how much Money he got, especially

pecially of barren Women, of whom he exacted what he would for these pretended Mandrakes. *Radices illæ, quæ humanam formam referunt, quas impostores & Nebulones. quidam venales circumferunt, infœcundas mulieres decepturi, factitiae sunt.* Mathiol. Lib. 4. cap. 71. The Apples of Mandrakes, how fair soever they be, have a soporifick Virtue, which cannot be withstood. *Levinus Lemnius* says, that he was obliged to take away those he kept in his Closet, where he was not able to stay a moment, without being seiz'd with an irresistible Heaviness and Desire to Sleep. *Explicat. Herb. Biblic. cap. 2.*

2. Nature, who represents in the Roots of Plants such extraordinary Figures, is no less wonderful in Flowers. Who can behold in the Passion Flower without Astonishment, the Instruments of our Saviours Passion? From whence this Flower, which the *Indians* call *Maracot*, is called by us Christians the *Passion Flower*.

Du Tertre, in his natural History of *Ango*, says that the Maracot is a Plant that creeps like Ivy, and whose Leaves are like those of a Wild Vine.

Its Flower is compos'd of a little Cup, containing about half a Glass, and from the top of it, about the breadth of a Quarter of a Crown Piece from the Edge, come out five or six little white Leaves about an Inch broad, pointed at the End: and just above these Leaves is a Crown of little Points, of the same substance with the Flower, as long as the Tags of Points, white, all streak'd, and tinctur'd as it were with Purple. In the middle

middle of the Flower rises a little Column, as well made, and even better than if it had been turn'd: Upon this Column is a little Club, called the Hammer of the Flower. Upon this Hammer are three Nails perfectly well made. From the bottom of the Cup around the little Column rise five white Points, that bear five little Gold-colour'd Tongues, like those that grow in the middle of our Lillies; and these are compared to the five Wounds of our Blessed Redeemer. Now seeing we find in this Flower the Crown of Thorns, the Whips, the Pillar, the Sponge, the Nails, and the five Wounds, 'tis with reason call'd the Passion Flower. *Ferrari* has given us an excellent Description of it, intermixt with much Piety, and embellish'd with all the Ornaments of his shining Eloquence. He treats this subject with much Niceness, but without forgetting that his Book is entitul'd *FLORA*, and that Flourishes are requisite when we speak of Flowers. *Flor. Lib. 2. cap. 11.*

3. There is no Plant in which Nature is more sportive, than in the *Orchis*, and in the *Satyrion*. The Flowers of all the sorts, whose number is very great, represent all of them some Animal or another. One is a Bird, another an Ape; now a Wasp, then a Hornet; a Bee, a Fly, a Butterfly, a Gnat, a Bug, a Spider, a Grasshopper, or some other Insect. Nothing is more diverting than to regard these Flowers. *Cornelius Gemma* had twenty six sorts of them. *Cornelius Labeius* and *Laurembergius* have described some they had, which were very particular.

But the most curious sort is that which is call'd *Ἀνθρωπόμορφος*, *Anthropophora*, because it represents a Man or Woman very exactly. *Kircherus* speaks of it in the following manner. There are certainly some Plants that are very curious and beautiful: among which we may place the Plants, whose Flowers have a human Shape. Nature has sported in them to that degree, that there is no part of a human Body, which she has not endeavour'd to express, even to the distinction of Sex.

Rara sane atque elegantes Plantarum species, quarum in nonnullis, quæ non incongrue Anthropolomorphæ dicuntur; ita luser Natura, ut vix sit in corpore humano membrum, quod non quantum potuit, exprimere suis conata, imò integram in floribus humani corporis structuram, sub utriusque Sexu architectata fuit. *Mund. Subterr.*

Tom. 2. Lib. 12. Sect. 1. cap. 9. Upon which *Ferrari* says very well: Who can believe it unbecoming of a Man to cultivate Flowers, seeing in Acknowledgement of the pains we take in their Culture, they seem to work with so beautiful Colours, to draw the Picture of their Benefactors? This Flower appears in the beginning of Autumn; but that which represents Women, comes in May. *Maio mense floret sylvestris in montibus Equicolorum, a crasso integumento dinescente, ac per oras purpurante suspensis muliebri formæ minutulis ludibriis, congerie in acutam fastigium decrefcente spicatis.* *Flora Lib. 2. cap. 3.*

Of the six sorts of *Orchis*'s, which the Learned of the Academy *Curiosorum Naturæ*, have procur'd to be engrav'd, the two first are those that represent Men and Women;

and

and which they call *Orchis Anthropophoros Mas*, and *Orchis Anthropophoros Fœmina*. Ann. 1671. *Observat.* 41. Nature in all these Miracles paints the Grandeur and the Majesty of the Creator of the Universe; and as much as she can, puts in her Works, Copies of Man, who is an original resemblance, and the Master-piece of his Maker.

4. See here another Miracle of Nature, which claims our Attention. I mean the *Distillatory Plant*, describ'd by the Learned of Germany: *Act. Eruditorum*, 1682. *Observ.* 145. *Hermannus Nicolaus*, who had seen this Plant, speaks of it thus. *Great are the Works of the Lord*, says the Wise-man, we cannot consider them without Ravishment. The Distillatory Plant is one of these Prodigies of Nature, which we cannot behold without being struck with Admiration: And what most surprizes me, is the delicious Nectar, with which it has often supplied me in so great abundance, to refresh me when I was thirsty to Death, and unsufferably weary. 'Tis ingrav'd in the Journal of *Leipsick*, which I but now cited. But the greatest Wonder of it is the little Purse, or if you will, a small Vessel, as long and as big as the little Finger, that is at the end of each Leaf: It opens and shuts with a little Lid, that is fastened to the top of it. These little Purses are full of a cool, sweet, clear, cordial and very agreeable Water. The kindness this Liquor has done me, when I have been parch'd up with Thirst, makes me always think of it with Pleasure. One Plant yields enough to refresh and quench the Thirst of a Man who

is very dry. The Plant attracts by its Roots the Moisture of the Earth, which the Sun by his Heat rarifies and raises up through the Stem and the Branches into the Leaves, where it filtrates it self to drop into the little Recipients, that are at the end of them. This delicious Sap remains in these little Vessels till it be drawn out: and it must be observed, that they continue close shut till the Liquor be well concocted and digested; and open of themselves when the Juice is good to drink. 'Tis of wonderful Virtue to extinguish speedily the Heats of burning Feavers. Outwardly applied, it heals Ring-worms, St. Anthony's Fire, and Inflammations.

This Plant grows not far from *Colombo*, the Metropolis of the Island of *Ceylan*. We find it in the Forests, whose Soil is moist, and that are very shady.

5. There are some Trees that must have Fire to nourish them, that they may preserve their Verdure and good Looks. I have seen, says *Methodius*, on the top of the Mountain *Gheschidago*, (the *Olympus* of the Ancients) near the City of *Bursa* in *Natolia*, a great high Tree, whose Roots were spread amidst the Fire, that issues from the Vents of the Earth. This Tree is so beautiful, so green, so full of Branches and Leaves, that one would think it derived its Vigour from some fresh and running Stream. I pretend not to give the reason of it; for we know that Fire consumes and devours all things: yet this Tree spreads its shady Boughs around, in scorn of the Flame in the midst of which

'tis planted. *Method. in Exposit. Dict. Apost. de Resurrect.*

6. Among the extraordinary Vegetations, those that are miraculous ought no doubt to find a Place. That which follows is of this kind. There was not one Family in the Tribe of *Levi*, but aspir'd to the Honour of Priesthood, and disputed it with *Aaron*. The Scripture tells us of the Rebellion of *Corah*, *Dathan* and *Abiram*, upon that Account. God taking pity of that stiff-neck'd People, who were hard to govern; and to put a stop to their Murmurings, which drew upon them such dreadful Punishments, was pleased to shew them by a visible Sign, that 'twas himself who had allotted the Office of High-Priest for the Person of *Aaron*. This was done in this manner. *Moses*, by the Command of God, order'd the Tribes to give twelve Rods, on each of which should be written the Name of the Prince of each Tribe. *Aaron* gave likewise his Rod, which was for the Tribe of *Levi*. God had declared, that the Rod of the Person whom he chose for High-Priest should blossom. *Moses* put them all into the Tabernacle. And it came to pass that on the morrow when *Moses* return'd into the Tabernacle, the Rod of *Aaron*, which was for the House of *Levi*, had budded, and produced Blossoms, from whence afterwards came Almonds. Numb. chap. 17. v. 8.

Nature never wrought so quick a Vegetation, and the Miracle cannot be contested. In one Night to produce Leaves, Blossoms and

and Almonds. None but the Author of Nature could so soon disclose the Sprouts contain'd in the Plants.

7. The following Vegetation is likewise very extraordinary; and therefore *Severus Sulpicius* gives it us for a Miracle. He says, that an Abbot, to make Trial of the Patience of a Man, who offer'd himself to be a Monk, planted in the Ground a Branch of *Syrax*, that he had then by chance in his Hand, and that he commanded his Novice to water it carefully every Day. He was to fetch the Water two miles from thence; for so far it was from the Monastery to the Nile, where he was obliged to take it. He obeyed this Injunction faithfully, going a Foot, and bringing on his Shoulders the Nile Water, plentifully to water the Branch; which for two Years together seem'd to be never the better for the Care that he took of it: but the third Year it shot out very fine Leaves, and afterwards produced Flowers: The Historian adds, that he saw in the Monastery some Slips of the same Tree, which they took delight to cultivate, as a Monument of what God had been pleas'd to do to reward the Obedience of his Servant. *Dialog: 1. de Virtutibus S. Martini.*

There are some Naturalists who deny the Fact, as *Wendelinus*, who makes a Scoff at *Bellarmin*, for relating it after *Severus Sulpicius* as a certain Miracle. *Mirand. Nil. cap. 24.*

Ray contests not the Fact, but is inclined to believe 'tis not Miraculous. He builds his

Opinion on what *Virgil* says, that a Branch of an Olive-tree will take Root, if we put it in the Earth, and take care to water it.

Traditur e sicco radix Oleagina Ligno.

Moreover, Experience justifies this Opinion of the Antients. *Fortunius Licetus* assures, that he had seen in his Unkles Garden, a great Branch of an Olive tree, quite dry, having been above ten Years separated from the Trunk, and lain all that while out of the Earth, take Root afterwards. 'Twas stuck in the Ground to support another peice of Wood to which 'twas Nail'd, that very Year it shot out Leaves and Branches, which after having Blossom'd, loaded themselves with Olives: And this new Olive-tree did the same thing for several Years. I conclude from thence, adds *Ray*, that the dry Stick which the Monk water'd by Order of his Superiour; who had a mind to try his Obedience, might, if by chance it were a Stick of an Olive-tree, shoot, grow and become a Tree without any Miracle. *Hinc Virga illa arida, quam Monachus a Superiore suo, ut obedientiam ejus probaret, jussus assidue irrigavit, si forte Oleagina fuit, potuit sine miraculo radices agere & germinare* Hist. Plantar. Lib. 1. cap. 18. This was not the Branch of an Olive-tree, but of a *Styrax*, an odorous Tree, from whence flows the *Storax*, a resinous Gum, whose Odour fortifies the Brain and rejoyses the Heart. The *Styrax* is a Tree common in *Syria*, from whence we have the *Storax* by the way of *Aleppo*.

8. *Bacon* says after some of the Antients, that if we set a Dish full of Water four or five Inches from a Cowcumber that begins to germinate, the tender Plant will in four and twenty Hours make its way to the Vessel in which the Water is. If this be so, adds that Learned Person, it must be confess'd, that some Plants are of a more excellent Nature than is generally believ'd, seeing they convey themselves towards the Place from whence they may draw their subsistence.

What is said of the Vine is likewise wonderful. 'Tis an ancient Tradition among Naturalists, that Vines shoot out their Branches on the side where Props are plac'd to support them. *Sylv. Syl. Cent. 5. n. 462.*

9. *Ray* relates on the Credit of *Pliny*, that there was in *Germany* Trees so big, that the *Germans* hollow'd the Trunk, and made use of it as a Boat that carried sometimes thirty Men. *Plin. Hist. Nat. lib. 16. cap. 40.*

In *Congo* there are Trees, which being hollow'd, make a *Canow*, in which two hundred Men may place themselves at their Ease.

The Trunk of the Tree that grows in *Malabar*, and which they there call *Atti-Meen-Aloa*, is generally fifty Foot in Circumference. There was one of this kind in *Cochin-China*, which lived two thousand Years, as 'tis said.

We read in a new Relation of *China*, that in the Province of *Sucha*, there is a Tree that covers four hundred Sheep with one of
 u 3 its

its Branches only; and that in the Province of *Chekiang* there is one that fourscore Men can hardly embrace.

Ray adds to this, that in *Oxfordshire* there is an Oak, whose Shade will cover three hundred and four Troopers, and four thousand three hundred sixty four Foot-Soldiers. *Hist. Plant. Londini in Fol. 1686.*

10. A Tree that bears Oysters is a very extraordinary thing: but the *Dominican Du Tertre*, in his Natural History of *Antego*, assures us, that he saw at *Guadaloupa* Oysters growing on the Branches of Trees. These are his very Words. The Oysters are not larger than the little *English* Oysters, that is to say, about the size of a Crown Piece. They stick to the Branches that hang in the Water, of a Tree called *Paretuvier*. No doubt the Seed of the Oysters, which is shed in the Tree when they Spawn, cleaves to those Branches, so that the Oysters form themselves there, and grow bigger in process of time, and by their Weight bend down the Branches into the Sea, and there are refresh'd twice a Day by the Flux and Reflux of it.

11. About the middle of the last Century, and in a time when *Germany* was brought to a low Condition by a War that had lasted thirty Years, when all despair'd ever to see the Peace, for which they so passionately long'd, 'twas said by way of common Proverb, *We shall have Peace when Roses grow upon Willows.* The Learned of the Academy, *Curius Nature*, affirm, that in 1648, a Willow

Willow produc'd a considerable number of the finest Roses in the World, and that in short this Prophecy was literally fulfill'd by the Event ; for the Peace was made that very Year. *Observat. 117. Ann. 1675.*

12. They that love Wonders will be pleas'd with the following Relation, of a Tree that might set up for good Breeding, Discretion, and perhaps something more ; since it very civilly saluted a Philosopher. To explain this Riddle I must tell the matter of Fact, for the Truth whereof *Philostratus* must answer. He relates that in a Conference held in *Aethiopia*, between *Apollonius* and *Thespisio*, the Chief of the *Gymnosophists*, where each of them boasted of his Philosophy, *Thespisio* taking the Word, said ; *Apollonius*, you have no great Opinion of us ; and some Body must have traduc'd us to you : But this Tree shall shew you that our Doctrine is not so much to be despis'd. There was an Elm hard by the place where they were sitting ; which as soon as the *Gymnosophist* had laid his Commands upon it, bow'd it self down, and saluted *Apollonius*, giving him the Title of *Wise*, with a distinct, but weak and shrill Voice, like a Womans. *Life of Apollon. Book 6. chap. 5.* The Men of Sense will dispute the Truth of this Story ; and others, who believe all the Tales of the Antients, will be apt to suspect some Witchcraft in it.

13. *Scaliger* against *Cardanus*, rallies him concerning a Tree call'd *μερσιδωρ*. 'Tis said that this Tree grows in the Island *Java*, and even there is very scarce. They add,

that instead of Pith it has an Iron Wire, that comes out of the Root, and rises to the Top of the Tree. But the best of all is, that whoever carries about him a piece of this ferruginous Pith, is invulnerable to any Sword or Iron whatever: This, says *Scaliger*, comes as near Lying, as we are desirous to avoid a voluntary Lye. *Jam enim est prope mendacium, quam nos à voluntario mendacio alieni.* Exercit. 181. Distinct. 27.

14. We have said already, that when a Plant petrifies, it degenerates by degrading it self to the Rank of Fossiles: it passes into a less noble Race than that of Vegetables: but quite on the contrary, when a Plant becomes an Animal, it ennobles it self, and rises into a higher Station, by acquiring a Sensitive Life. See here a Tree of this second sort. Near the Island *Cimbalon*, there lies another, where grows a Tree, whose Leaves, as they fall off, change into Animals. They are no sooner on the Ground, but they begin to walk like a Hen, upon two little Legs.

Pigafetta says, that he kept one of these Leaves eight Days in a Porringer: that it took it self to walking as soon as he touch'd it, and that it liv'd only upon the Air.

Scaliger speaks of these very Leaves, and says, as if he had been an Eye-witness of it, that they walk, and march away without more ado, when we go to touch them. *Exercitat. 112.*

Bauhinnus says, they are very like the Leaves of Mulberry-trees, and that they have on each

each side two short and pointed Feet. If this be so, says this Learned Botanist, 'tis to be believed that those Leaves, as they grow rotten, acquire a more noble Life, that is to say, a sensitive Life, which the Naturalists have never separated from progressive Motion. They must therefore no longer be reckon'd among the Race of Vegetables. 'Tis however a great Prodigy that the Leaf of a Tree should change into an Animal, obtain Sense, and be capable of progressive Motion. *Bauh. Hist. Plantar. Tom. 1. Lib. 5. cap. 58.*

15. The Blind Man to whom our Saviour restor'd his Sight, said at first, *I see Men walking as if they were Trees*; Mark chap. 8. v. 24. But *Anastasius* of Nice says on the contrary, that he has seen Trees walk as if they were Men. He being persuaded that by the Force of Magick Charms and Incantations, our Neighbours Trees may be brought into our own Field, relates that a Heretick of *Zizicum* of the Sect of the Pneumatomachians, had by the Virtue of his Art brought near to his own House, a great Olive-Tree belonging to one of his Neighbours, that he and his Disciples might have the Benefit of the Freshness of the Shade, to protect them from the Heats of the Sun. *Anastas. Nic. Quæst. in Sac. Script.*

By this Art it was that the Plantation of Olives, belonging to *Vettidius*, chang'd its Place. For in short, all Antiquity believed, that Necromancers could change, if not all the Geography, at least the whole Topography

graphy of a Region ; put a Mountain in the place of a Valley, and confound and displace the Park, the House, the Avenues, the Fountains and the Brooks, that a Man should not know where he was in the midst of his own Estate.

Thus *Petronius* makes his Sorceress *Enothea* say, that she could command the Earth to be Barren or Fruitful ; that she could rule the Waves of the Sea, calm Tempests, change the Course of Rivers, make Lions and Tygres lay aside their fierceness, and even draw down the Moon from Heaven.

Quisquid in Orbe vides, paret mihi : Florida
(*Tellus*)

Cum volo, spissatis arefcit, languida succis ;
Cum volo, fundit Opes ; Scopulique atque horrida
(*Saxa*)

Niliades jaculantur aquas. Mihi pontus inertes
Summittit fluctus : Zephyrique tacentia ponunt
Ante meos sua flabra Pedes : Mihi flumina parent,
Hyrcaque Tygres, & jussi stare Leones.
Quid leviora loquor ? Luna descendit Imago
Carminibus deducta mais ———

Ovid ascribes to *Medea*, the power of making Grapes and Fruits drop off the Vines and the Fruit-trees, and of changing Corn into Grass that bears no Ears.

Carmines lasa Ceres sterilem vanescit in herbam ;
Deficiunt lasi Carmines Fontis aqua.
Illicibus Glandes, cantataque vitibus Uva
Decidit, & nullo poma movente cadunt.

'Tis

'Tis impossible to believe all that the Poets tell us. There must be a great deal of Fiction in all this. If Witches had so great a Power, there would be no safety upon Earth.

16. The Naturalists, as well as the Poets, are often too lavish in the praise of Plants. They say that a Plant of Rosemary or a Gilliflower, that is in a Chamber-Window, withers and fades away, when the Master of the House dies, unless some of the Family take care to remove it. *Hanneman.*

The Story of the Plant which the Emperor *Marcus Aurelius* knew, and by touching any one with its Juice, could infallibly make them fall in Love with him, may very well be Apochryphal. *Lauremberg. Horticult. Lib. 2. cap. 5.* If that Philosopher made use of it in regard to his Wife *Faustina*, it wrought no great effects: for that wise Prince was perhaps the Man of all the World whom she lov'd the least.

If we strip off the Bark of Elder from the Bottom upwards, we vomit immediately: but if we take it off from the Top downwards, we are forc'd to run to the House of Office. *Van-helmont* says the same thing of the *Asarum*. If the first Story be no truer than the second, they are both false: with submission be it spoken to the otherwise very Learned Naturalist, *Christianus Fromannus.*

OBSER-

OBSERVATION.

One of the most wonderful Plants is that which so mollifies the Bones, that when we have eaten of it, we cannot stand upon our Legs. An Ox who has tasted of it, cannot go: His Bones grow so pliant, that you may bend his Legs like a Twig of Ozier. The Remedy is to make him swallow some of the Bones of an Animal, who dy'd with eating of that Herb. 'Tis certain Death, and cannot be otherwise, for the Teeth grow soft immediately, and 'tis impossible ever to eat again. *Observat. 38. Curiosor. Nat. Ann. 1.*

There is a Plant that produces a quite contrary Effect. It hardens the Bones to a wondrous Degree. A Man who has chew'd some of it, will have his Teeth so hard, as to be able to reduce Flints and Pebbles into impalpable Powder.

There are other Cases where we are more puzzled. We ought not to favour Superstition, nor countenance the execrable Villanies of Magick: nor may we on the other Hand derogate from the Honour of Nature, the extent of whose Power and Mechanicks we are ignorant of. Nevertheless we are often forc'd to give Judgment on these matters, and 'tis a rudeness not to answer those that consult us. The Learned *J. L. Hanne-mannus* tells us, that he had seen a Man possessed with an Evil Spirit, so strong, and so furious, that four of the most robust Fellows could

could be found, could scarce hold him. He adds, that there was a Person of Quality present, who advis'd to bind his Feet and Hands with the Bark taken from the Branches of a Lime-tree; which he said would make him grow as tame as a Lamb. They did so; but the Demoniack lay beating the Ground with his Head, insomuch that 'twas fear'd he would kill himself. Then they bound his Head likewise with some of the same Bark; as with a Diadem, and he grew absolutely calm and gentle immediately. *Method. cognosc. Vegetab. pag. 145.* This matter of Fact is attested as a certain Truth: supposing it to be so, it deserves the inquiry of Philosophers.

'Tis not the common People only who say, that no Inchantments can be thrown into a House, if an Onion be hung in the Entry. They are Philosophers of great Credit from whom we have these Observations. I mean *Pythagoras* and *Pliny. Hist. Nat. Lib. 20. cap. 9. lib. 2. cap. 168.* who adds that a Bough of Buckthorn laid at the Doors and Windows of a House, hinders Conjurers and Witches from doing any hurt by their Sorceries.

After all, the Theologians hold that Natural things have no power over Evil Spirits. Thus what *Pliny, Apuleius, Dioscorides*, and a World of German Authors have published of the Virtues of Rue, of Birth-wort, of Peonies, of St. John's-wort, of the Sun-Flower, and of black Mullein, are Superstitions, which Christians, who have the Fear of God before their Eyes, ought carefully to avoid.

avoid. The Power of driving out Evil Spirits is reserv'd to the Church. D. Thomas in 4. d. 7. Art. ult. whose Opinion we ought to stand by.

C H A P. XXIII.

Diana's Tree, an Artificial Metallick Vegetation.

VVegetation is an inexhaustible Subject. The farther we advance, the more Wonders we find that surprize us, and for which we can give no Reason, One would think that the three Races of the Elementary World were divided by sacred Bounds, which Nature would never violate: And yet these three Races would sometimes in-croach upon one another. The Wood, and the Parts of Animals that petrifie, leave their own Tribes, and enter into the Family of Fossils. What can we say to what Borellus has observ'd in several parts of Europe? He assures, that he himself has been Eye-witness of Horns of Sheep and Oxen, which being planted in the Earth, took Root, and became Plants. *Cornua etiam vervecina & bubula vidi, quæ radices in terra egerunt: ut Cornu plantabiles.* J. Linchotii. Cent. 4. Observat. 52. This cannot be comprehended, and all the Authority of Borellus can scarce make us believe it. Thus Redi frankly declares, that

that his Faith is not large enough to give credit to such Stories: and he laughs at the Relations they give us, of Horns that take Root and grow near *Goa*. He falls on the Women of the Country, accusing them of Dissoluteness, and thence takes occasion to rally the *Portuguese*. *Experiment. Nat. page 165.*

The very Metals form themselves into Plants, as if all Nature would have a hand in the Affair of Vegetation. *Matthew Paris* in his History of *France*, speaks of a rich Mine of Gold, which in 1602. was discover'd in the Vineyard of a Peasant, near the Village of *St. Martin la Plaine*, in the Country of *Lyons*. He tells us, how they presented to *Henry IV.* a piece of this golden Mine, that was shap'd like the Branch of a Tree. *Tom. 2. l. 5.*

Art too concerns it self in making Metallick Vegetations. They who are but little conversant in the Works of the Chymists, cannot be ignorant of *Diana's Tree*, otherwise call'd the Philosophers Tree: which is no doubt, one of the most curious Operations of Chymistry: and we need not have a refin'd Taste, to regard, as no indifferent thing the Artificial Vegetation of Silver: by which we see a Tree form it self, and grow by little and little from the bottom of a Vial, fill'd with Water.

De Furetiere says, that he had seen vegetation at *Paris*, the Metals of Gold, Silver, Iron and Brass, prepar'd with *Aqua fortis*, in which he saw a sort of a Tree rise up, which

which he perceived to grow and divide it self into several Branches, the whole height of the *Aqua fortis*, as long as there remained any substance. They call this Water, *the Water of Flints*: We are obliged for the Secret of it to *Rhodus Canasses*, a Greek Chymist, of whom the *Journal of the Learned* of 1677. makes mention.

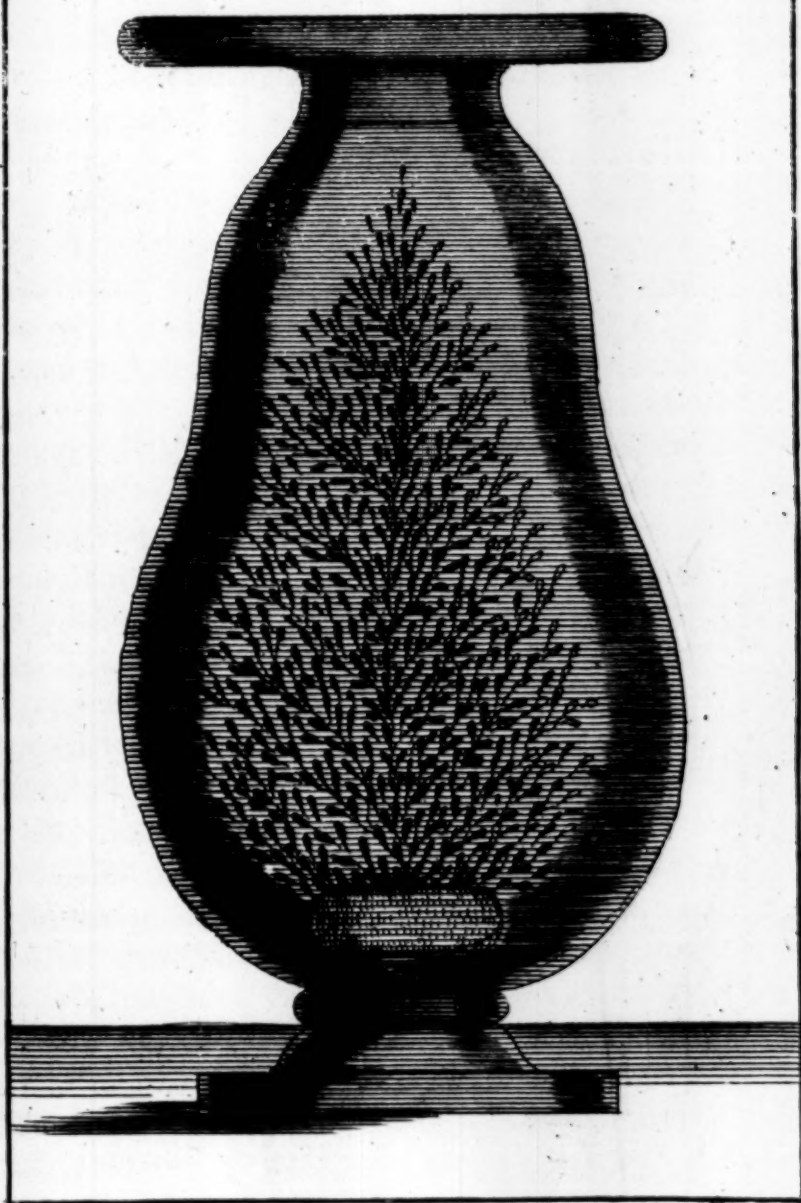
This Experiment is too curious not to inspire us with the Desire of knowing how the Operation is perform'd: *Lemery*, who is so renowned for his excellent *Course of Chymistry*, tells us we must proceed in the following Method.

This Operation, says he, is a Composition of Silver, of Mercury, and of Spirit of Nitre, that have cristaliz'd themselves together in the shape of a little Tree.

Take an Ounce of Silver, and dissolve it in two or three Ounces of the Spirit of Nitre: set the dissolution to evaporate over an Ash-Fire, till about half the Humidity be consum'd. Pour what remains into a Matrafs, having first put in it twenty Ounces of clear common Water. Set your Matrafs upon Straw, and let it stand forty Days without moving it. You will find that within that time it will have form'd a sort of Tree, with Branches and little Balls at the end of them, which represent the Fruit. Then *Lemery*, in his learned Remarks, finds a great Analogy between this Operation, and what passes in the Earth in order to the Generation and Growth of Plants. *Cours. de Chymic. Part. 1. ch. 2.*

The

Dianas Tree





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The tediousness of this Operation put *Homberg*, whose great Capacity in the Art of Chymistry has render'd him in mighty Esteem with all the Learned, upon finding out a way to hasten this Artificial Vegetation: and he has actually discovered a method to make the Philosophers Tree in less than a quarter of an Hour: and the Memoirs of the Royal Academy of the Sciences speak of it in this manner.

The Artificial Vegetation of Silver, commonly called *Diana's Tree*, or the Philosophers Tree, is one of the most curious Operations of Chymistry: but 'tis so long and tiresome, that few have patience enough to see the end of it. Now *Homberg* not only teaches a method to make this Operation in a very little time, on the same Principles by which 'tis generally made, but likewise explains the Formation of this Philosophical Tree, otherwise than any have done, who have hitherto treated of it. For most of them have said, that in this Operation, Art mimicks what Nature does, when she produces Silver in the Mines; and some have pretended that this Artificial Vegetation is like the Vegetation of Plants. But *Homberg* proves that there is a vast difference between these Artificial and Natural Vegetations; and that even the Artificial are very different from one another: because they are not all made on the same Principles, nor by the same Mechanicks. Now this is *Homberg's* Method to make the *Diana's Tree* more speedily than 'tis generally made; though it be grounded on the same Principles, and

exactly like the other ; except only that the Vegetation is a little stronger than any that have been yet made ; and that whereas the usual Operation costs six Weeks time, this is perfected in less than a quarter of an Hour.

Take four Drams of fine Silver-Dust : make a cold Amalgame of it with two Drams of Mercury : dissolve this Amalgame in four Ounces of *Aqua fortis* : pour the dissolution into about a Quart of common Water : beat them a little together to mingle them, and keep them in a Vial close stopt. When you would make use of it, take an Ounce of it or thereabouts, and put into the same Vial the bigness of a Pea of the common Amalgame of Gold or Silver, that ought to be as soft as Butter ; and set down the Vial for two or three Minutes : immediately after you will see some small perpendicular Filaments coming out from the little Ball of Amalgame, and augment and shoot out little Branches on the sides, till they form themselves into Shrubs, such as that represented in the Figure. The little Ball of Amalgame will harden, and turn to a dull white Colour ; but the Tree will have the true Colour of polish'd Silver. All this Vegetation may be finish'd in a Quarter of an Hour. *Memoires de l'Academ. 30. Novemb. 1693.*

This Method is quicker, but the former has a great Advantage over it. The common Philosophers Tree rises four Inches high in the Glass, which happens not to the Tree made after *Homburg's* way, as he himself

self declares. He explains admirably well the Formation of this Artificial Tree. He says, 'tis not form'd by the Amalgame at the bottom of Water; but by the Mercury and Silver that are dissolv'd and swim in the Liquor. Now this Dissolvent being extreamly weaken'd by the great quantity of Water, we throw in amongst it, is not capable of retaining what it has dissolv'd, when ever any occasion offers to cast it off, or to separate it. Then the dissolv'd Mercury coming to find at the bottom of this Water, an Amalgame of Mercury not dissolv'd, sticks to it in the same manner as Mercury. The Dissolv'd Silver is likewise carried that way, being accompanied with some nitrous Particles of the *Aqua fortis*. All these little Bodies cleave on all sides to one another, and form the Branches that appear in the Vial: By which we see that in this Operation there is no real Vegetation, but that 'tis nothing but a simple Crystallization.

They who have any Taste of true Philosophy, may there find wherewith to satisfy, and delightfully to employ themselves. This Explication which *Homberg* gives us, is no less agreeable than his Experiment on *Diana's Tree*. The Mind finds no difficulty to submit to a Philosophical Doctrine, that has all the Air and likelihood of Truth.

Kircherus had in his Closet at *Rome* such a Metallick Tree, of which he gives an excellent and lively Description in his *Museum Colleg. Rom. S. I. pag. 46.*



H A P. XIV.

The Antiferous Plant, a Maritime Vegetation.

THis were the place to speak of the *Borametx*, that *Zoophyte*, or famous Plant-Animal, of which so many Authors have written. But as I take it, this pretended Prodigy of Nature, is at this day allow'd to be a Fable. See here what *Scaliger* says of it. Regard as a Trifle all that I have hitherto said, in regard to what I am now going to tell you. There is a wondrous Plant indeed among the *Tartars*. *Zavolha* is the most considerable of all their *Hordes*: 'tis even remarkable for the Antiquity of its Nobless. In that Province they sow a Seed not unlike the Seed of a Melon, except that 'tis not so long. There comes from it a Plant, which they call *Borametx*, that is to say, a *Lamb*: and indeed the Fruit of that Plant has exactly the Shape of a Lamb. We see distinctly all the exterior Parts; the Body, the Feet, the Hoofs, the Head, the Ears; there wants nothing but the Horns, instead of which it has a sort of Wooll, that imitates them not amiss. The *Tartars* flea it, and make themselves Caps of the Skin. The Pulp, that is within the Fruit, is very much like the Flesh of Crabs. Cut it, and the Blood gushes out, as from a wounded Animal. This Lamb feeds it self with all

all the Grass that grows around it, and when it has eaten it all up, it dries, and dies away. But what perfects the similitude between the Borometz and a Lamb, is that the Wolves are very greedy of this Fruit, which no other Beasts ever care for. But I believe this last stroke, adds *Scaliger*, to be only a seasoning to make the Fable go down. *At hoc ultimum quasi condimentum, atque intritum ad fabula, & agni allusionem adjunctum arbitror. Exercitat. 181. n. 49.*

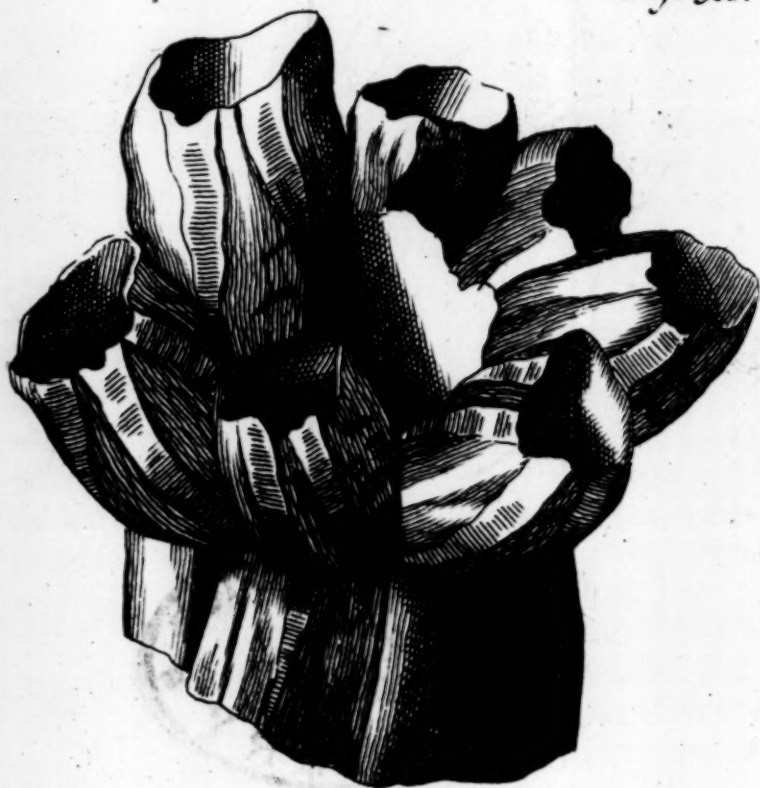
The *Barnacles* of Scotland would take it amiss, if we omitted to speak of them. They are almost like Ducks, and pass for Fish in France, because their Blood is cold.

The Learned have made some inquiries to discover the Origin of those Birds, yet what they know for certain is, that they are very common in Scotland, and in the North, even as far as *Greenland*.

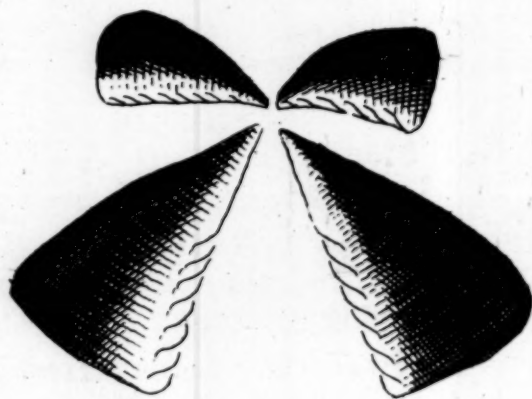
They who treated first of them, said, they were engender'd of the old Wood of rotten Vessels. Others believ'd that they came from the Leaves of Trees, that fell into the Sea, and which the Salt Water chang'd into Birds. This Opinion, which had many Followers, is now wholly reject-ed. 'Tis so directly contrary to the Principles of Natural Philosophy, that 'tis strange how Men of Sense could be led away by it. There is at the end of the Sixth Book of *Johnston's Thaumato-graphia*, a Discourse of *Michael Mejerus*, where we find some good things concerning this Vegetable Fowl: but the Historical Part of what he says of it, is better than the Physical. His Opinion is

that those Fowl actually proceed from rotten Wood. Upon this foundation he makes a great shew of his *Peripatetick* Principles to little purpose. I find, says he, *the efficient Cause* of the Generation of this Bird to be in the Sun, whose vivifying Heat contributes to the Generation of all things. So far he is right. *The Material Cause* is the rotten Wood. That's the Question. *The Final Cause* is the Glory of God, and the Ornament of the World. There he speaks like a Christian. For the *Formal Cause* he knows not what to make of it. He searches for it in every Creek and Corner; and fatigues himself to such a Degree, that we cannot but pity him. But at last he must have a *Substantial Form*, without which all the rest signifies nothing. After having run through the whole Universe, he leaves the Elementary World, and mounts up to the Region of the Stars, where by the greatest good Luck in the World, he lights upon a *Sidereal Form*, which he marries to the rotten Wood; and from this wonderful Marriage he makes Barnacles be born without number. And indeed *Childray* in his *Wonders of England*, says, that there is so prodigious a Quantity of these Fowl in *Scotland*, that when they are on Wing, they often darken the Sun. He adds, that they are hatch'd from Eggs, as other Birds. But this is no better than the *Sidereal Form* of *Majerus*. I believe that *Childray* is wide of the Mark. He did not reflect, that Animals, whose Blood is cold, as is the Blood of Fish and of Barnacles, never brood upon their Eggs.





The anatisferous Plant



Eggs. And indeed to what purpose should they: If they did it to warm them, they would lose their Labour: for Fish and Barnacles are themselves as cold as Marble: I believe him therefore under a Mistake, and that he took Ducks for Barnacles.

I believe I may boldly assert, that Barnacles lay their Eggs as Fish do theirs; and leave them at the Mercy of the Water to take their Fortune: that the Sun hatches them; that as they float in the Water, they stick to what they meet, especially to rotten Wood, because 'tis cover'd with a viscus Matter that holds them: that they cleave likewise to Sea-Weed, and other Maritime Plants, upon which we may observe likewise a glutinous Substance. I also believe that these Eggs have no Shell, but only a Skin, like the Eggs of Fish. I hope what I have said concerning the Origin of Barnacles will help to explain my *Anatiferous Plant*.

What I call an *Anatiferous Plant*, is called *Concha Anatifera*, an *Anatiferous Shell*, by *Calceolarius* and *Wormius*. That which *Calceolarius* describes, and of which he gives the Figure, is a Stem, made like a Plant, a Foot high, with several Branches: and which can in no wise come under the Denomination of a Shell. *Wormius* represents one quite different from this; but that has not neither the least Appearance of a Shell. There grows out from the Centre of it, as from the Root of a Plant of Violet, or of *Asarum*, ten or twelve sorts of Leaves. I have one of this sort, which is very curious. 'Twas found on

the Prow of a Ship, that return'd from a long Voyage, and was sent me from *Normandy*. Its Figure is beautiful: 'Tis a Conjunction of eight Shells, that look not unlike a *Nofegay* of Tulips: and therefore I sometimes call it a Sea-Nofegay. And indeed it actually is a Maritime Vegetation, and deserves no less to be plac'd among Plants, than the *Corolloides*. Its Stem approaches the Figure of a Tulip, and is as thin as a *Muscle-Shell*. Towards the top there are seven others, all of them exactly of the same make. The Matter is just the same as that of which *Muscle-Shells* are made, except that these I speak of are glossy, and red and white in some places. The entrance is at top, and shuts with four Doors, that joyn in a manner, which cannot be too much admir'd. It remains only to know, how this Sea-Plant and the little Inhabitants that are lodg'd in these Apartments, which are so artfully made, are form'd. The Doors of these little Cells were likewise sent me; and 'tis a charming Amusement to set them in Order again as Nature had first dispos'd them. I remember what *Palissy* says on a like Subject, in his Book intitul'd, *The Way to grow Rich*. *Have you ever seen any thing made by the Hand of Man, that joyn'd and clos'd so exactly, or that so resembled each other, as the two Shells of Cockles and Scallops?* 'Tis not without Reason that the great Men in all Ages have been struck with Admiration at the sight of them, There is no Curiosity that goes beyond them. The surprizing Figures, the Sports of Nature, the Beauty of the Colours, and the

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wonderful Diversity, are things indeed delightful, and we might spend whole Years unwearied in the Examination of them.

1. I say then that Barnacles are not made, either of rotten Wood, nor of these Leaves, or Apples that drop into the Sea. 'Tis time to abandon that false Opinion; it being now acknowledg'd for a certain Truth in Physicks, that there can be no Generation without Eggs.

2. I say that the different Shells of my Anatisferous Plant, that are made like so many Tulips, are the Nests, where these Fowl, whose Origin has hitherto been so obscure, are both form'd and hatch'd.

3. *Du Tertre* has Philosophiz'd very judiciously, when he says that the little Oysters, which stick to the Branches of Trees that grow on the Edge of the Sea, in which they soak every Tide, are form'd of the Seed, which the Oysters shed along the Rock, and which the Waters carry away, till it finds some Plants, some rotten Wood, or some Stones to cleave to.

4. The Shells of *Testaceous* Fish, whether Oysters, Cockles, Muscles, Purples, &c. are known to grow, proportionably as the Fish that are in them. 'Tis the same thing with the Snail and its Shell. The House grows according to the Bulk of its Inhabitant. This is not the place to shew how this happens, and the Task is more difficult than 'tis imagin'd to be. In the Land of Nature we are often out of our Knowledge, and meet with something at every step, capable to mortifie and humble the Minds of the Haughty.

5. 'Tis

5. 'Tis therefore certain, seeing Nature acts by ways most plain and simple, that the Shell, or Anatiferous Plant, where the Barnacles are form'd, grows proportionably as the Seed dilates it self, or as the Parts of the Bird grow larger.

6. Hitherto there is no difficulty : These Observations are evident ; but what remains is more intricate : for it must be shewn how the Barnacles and Anatiferous Plants are made for one another. I will give my Conjectures of this Matter, and endeavour to strengthen them by Reflections taken from the Authors who have treated of the Origin of these Fowl.

I believe that what *Childray* says of the Eggs that Barnacles sit on, is a meer Vision. He has confounded Barnacles and Wild-Ducks together. There is as much difference between them as there is between Flesh and Fish ; between Animals whose Blood is hot, and Animals whose Blood is cold. My Opinion is, that Barnacles, which are nothing but Fish under the Figure of Birds, lay Eggs as the Fish do theirs, and that, like theirs too, they float up and down at the Mercy of the Waves of the Sea, till they stick to some Plants, Herbs, Woods or Stones ; where the Heat of the Sun afterwards hatches them. These Eggs are of a slimy Substance, as the Eggs of Frogs ; so that they easily stick to whatever they meet, whether Sea-Weed or any other Sea-Plant ; or to the little Moss that grows on the Stones and Rocks, and on Wood that has long lain floating in the Sea.

Of

Of this Egg, which contains the first Rudiments of the Bird, are form'd the Shell, and the little Fish, to whom Nature will in time give Feathers and Wings, that it may when it pleases, rise up from the Sea into the Region of the Air. When it shall no longer have its Shell to guard it from its Enemies, Nature will supply it with Wings, to fly from, and avoid them. Thus all along an infinitely wise and adorable Providence attends it.

But I must now strengthen my Conjectures, and shew that my Opinion is not a vain and empty Imagination.

I apply to the Origin of our Barnacles, what *Du Tertre* says of the Formation of the little Oysters, with which he has seen Branches of Trees all loaded. *No doubt, says he, the Seed of the Oysters, which is shed into the Sea when they spawn, sticks to these Branches, so that the Oysters form themselves there, and grow bigger in succession of time.* The Formation of Barnacles is exactly the same. Thus we say of them, what *Du Tertre* says of the Oysters: No doubt but the Seed of the Barnacles, which is shed in the Sea, when they spawn, sticks to these Branches, these Plants, this rotten Wood, and these Rocks, so that they form themselves there, and grow bigger in process of time. This is the most rational thing that can be said on a Subject little known, and perhaps neglected, how curious soever it be. Besides that the Historians of the North, by their little exactness and knowledge in Physicks, have led the World into an Error, by having first pub-

publish'd, that these Birds were engender'd of the rotten Wood of old Vessels.

I. We affirm therefore against *Childray*, that these Fowl come not from Eggs that are hatch'd : and that they form themselves and grow in the Shells ; that are as it were the Flowers of our Anatiferous Plant, or Sea-Nosegay.

Chiocens in the *Museum Calceolarii*, relates that in a learned Conversation with *Pancratius Mazzanghius Borghæus*, who was then in his Travels, their Discourse fell on the subject of the Anatiferous Shell ; and that that curious Person told him, that he had seen in the Closet of the Duke of *Tuscany*, a Branch that bore several Shells, almost round, whitish, shining, and thin as Muscle-Shells : and that Birds sprung from them. *Ex quibus Conchis in mare lapsis aves prænarratas excludi referebat.* Sect. 1. pag. 26.

Wormius says, the Anatiferous Shell is triangular, whitish without, shining, light, an Inch long, and not quite so broad. It shuts with four Doors, two whereof are one half bigger than the other. When they are open'd, we discover the little Fowl, as yet all unfashion'd ; but easie to be known by its two Wings, its Head and its Beak. This Shell is like that which *Lobelius* pull'd from the Keel of an old Vessel in the *Thames* at *London*. The *English* call these Fowl *Barnacles*, and the *Scotch* in their Language *Clakis*. There are many of them in *Scotland*, where they are taken in the Winter. The *French* call them *Marguerolles* and *Macreuses* ; and in *Lent* many of them are brought out of *Nor-mandy*

mandy to *Paris*, where they are sold for Fish. Nay, I have been told by a *Frenchman* of Credit, that 'twas decided in an Assembly of the Theologians of the *Sorbonne*, to take the Barnacles from the Race of Birds, and to place 'em among the Fish. *Imo a fide digno Gallo accepi, publica Theologorum Sorbonistarum Sententia in Piscium non autem Avium Classem relatas esse has Aves.* Musæum Wormian. Lib. 3. cap. 7.

Scaliger speaks at first like a Man led away by the vulgar Errour; but what he says afterwards as an Eye-Witness, is very consonant to my Opinion. We have learnt, says he, with Astonishment, that a Bird, which we know not here, and which is made like a Duck, is form'd in the *British* Sea, sticking by its Beak to the rotten Wood of old Vessels; from whence it gets not loose, till it be intirely form'd, to go in Chace of Fish, which are its only Food. The *Gascons* call these Birds *Crabans*, and the *Britains*, Barnacles. A Name that is grown into a Proverb: for when we have a mind to reflect on a dull, lazy Fellow, who is fit for nothing, we say of him, that he is a Barnacle, neither Fish nor Flesh. I will conclude this Subject by a Story that is very extraordinary; and I have seen the Wonder I am going to relate. There was brought to *France* I. that Great and Good King of *France*, a Shell that was not large, in which there was a little Bird intirely form'd. It stuck to the Shell by the Ends of its Wings, of its Beak, and of its Feet. The Learned, to whom that Monarch was a tender Father, and

and a liberal Benefactor, were of Opinion, that the Fish, which had been in the Shell was chang'd into a Bird. *Mutarum in aviculam Ostreum ipsum existimarunt.* Exercit. 59.

All these learned Men argu'd as Persons unacquainted with the Truth of the Matter. These Birds hold by the Beak to the Shell, and not to the rotten Wood, as *Scaliger* believ'd. Some have been seen that had already their whole Body out of the Nest, if I may so call it, and that yet hung fast by the Beak: which gave rise to the vulgar Error, that Barnacles are engendered of rotten Wood, and that they are found sticking by the Beak to old Vessels. However they have said enough to lead us to the Truth, and to help us to avoid the Mistakes into which they themselves have fallen. Laying aside therefore the Fables and the Errors of the ancient Physiologers, I add, that the Learned, even in the time of *Francis I.* were grossly mistaken, to imagine that in this Shell, there had been at first a Fish like a Muscle, or an Oyster; that in process of time came to have Feet, Wings, Feathers, a Head and a Beak, by metamorphosing itself into a Bird. These Changes will not pass, except in the Country of Fables and Visions. *Majerus* invincibly refutes this Error, by rejecting the Opinion of the Northern Historians, who believ'd, that Barnacles came from Leaves or Fruits that fell into the Sea. He shews that the three Races of the Elementary World are separated by inviolable Boundaries, which Nature never trans-

transgresses. How, says he, can a meer Vegetable become organiz'd to form it self into a flying Animal like a Duck? Is not the Tree known by its Fruit, which is either good or bad, and agrees with its Kind? And is it not likewise the Fruit, that teaches us to distinguish the Race, and from whence it descends? Certainly Trees never bear Fish, and the Sea engenders no Trees. The Kingdom of Vegetables holds no Commerce with the Kingdom of Animals: They are two different Races, and the Subjects of the one, never encroach nor set a foot upon the Dominions of the other. Each remains in its Tribe, which 'tis not permitted it to leave. *Vegetabilis igitur genus non miscetur animalis. Quodlibet manet in sua Tribu, quam non egreditur.* Jonston. Thaumatograph. Class. 4. append.

II. It only remains for me to justify my Conjectures concerning the Beginning, the Progress, and the perfect Formation of these Birds, by the Testimony of such as had some Knowledge of them. *Majerus* is indeed the Person, who has best follow'd this Generation, and explained most things concerning it.

To take, says he, this Affair from its Origin: We observe that in *Scotland* and in *Ireland*, and in the Countries that lie more Northward, especially in the places of the Sea where there is most Sea-Weed, and other Sea-Plants, the ends of those Plants are loaded with an infinity of these little Shells: which proves that this Generation comes not from rotten Wood: That Opinion

nion I cannot allow : Experience cries out against it. Neither may we imagin that these Birds derive their Origin from Trees. Upon what can we ground such a Belief? Trees produce not Birds, but Fruits according to their Kind. These Shells at first are no bigger than the top of the little Finger. We find also many of them against the Rocks : but the greatest part stick to the Strings of the Weeds that we find around the pieces of Masts, and other Wood, that grow rotten in the Sea. If we open these little Shells, we discover little Embryo's of Birds, such as we observe in Eggs that have been brooded. We may easily perceive the Beak, the Eyes, the Feet, the Wings, the sprouting Feathers, and all the other Lineaments of the Embryo of a Bird. As this little Creature increases, the Shell too grows bigger : and this it has in common with Snails and Tortoises, with all Testaceous and Crustaceous Fish, and with all the Animals that carry their Houses with them.

Prout fœtus crescit, ita & concha seu tegumenta eorum, quemadmodum in aliis omnibus Ostreis, Conchis, Cochleis, Testudinibus, & his similibus domiportis contingit. 'Tis the fruitful Water of the Sea, and the Heat of the Sun, that supply them with Heat and Nourishment. If a Man consider the Variety and vast Abundance of the Fish and Animals which are produced in the Sea, he will no doubt allow the Waters of it to be wondrously fruitful. It produces the largest of all Animals, which are the Whales : some of which, according to *Pliny*, have been taken that were

six hundred foot long, and three hundred in bigness. There are in the Sea a hundred seventy six sorts of Fish; besides the several Kinds that are in Rivers. Let us cast our Eyes but a Moment on the ravishing variety of Shells, which are sometimes the Delights of great Men. In the year 1611, I saw at Rotterdam, in the House of *Petrus Carpenterius*, perhaps a thousand different sorts; and all of them were Objects no less charming to the Eye, than Subjects of sublime Contemplation for the Mind. This illustrious Person had fill'd a great Chamber with Shells, which were the richest and most curious Treasure of Nature, that I ever saw. As many Shells, so many Wonders and Prodigies, tho' they were only the little sports of Nature. But in these pretty Toys she render'd visible the Fruitfulness of the supream Genius, that animates and guides her. *Has esse luxuriantis Naturæ Insignia, quibus ingenii sui ubertatem attestari velit, non est dubium.*

The Heat of the Sun does to the Eggs of these Barnacles, the Office of the Hen when she broods over her Eggs. His Heat is the efficient Cause of Generation, by assembling the Homogeneous, and seperating the Heterogeneous things. The Seeds of Fruitfulness without Heat continue folded up in matter. When Winter comes, a world of Insects perish, and their Race would be extinct, were it not that their Posterity is conceal'd in their Seeds that remain. They all seem in a Lethargy during the Winter; one would believe they were totally destroyed. But the Spring returning by the Approach of the

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Sun,

Sun, vivifies Nature, that for several Months has lain benumn'd, and in a State of Inactivity. The Rays of the Sun, by warming the Earth and the Waters, open the Sepulchres, where an infinite number of Animals lay hid in the Shades of Death : or to speak without Figure, the Heat of the Sun opens the Seeds, in which the Cold detain'd so many living Beings, who waited only for the time of their Deliverance. No sooner is that Planet mounted to the Vernal Equinox, than we see appear again on the Scene of the Elementary World, the Flies, the Gnats, the Butterflies and the Frogs, whose Races we believed to be extinct. The Eggs of Fish open likewise in Rivers, and in the Sea ; the Seeds germinate in the Earth ; the Birds hatch their young ; all Nature is in Labour, intent on repairing by new Births, the Breaches that Death, who mows down all, continually makes in the Region of the Elements. The Sun is the light of that World, and he vivifies in it whatever he enlightens. For whenever his Heat surrounds a mixt Body, in which there is an Atom of Life shut up, he warms and puts it in motion, dilates and excites the sparkle of Fire, concentr'd in it, to exert and unfold it self : and then the hidden Seed manifests it self by its own natural Actions, and by giving signs and tokens of Life, discovers the Treasure that was concealed in that mixt Body. Thus some imitate the natural Heat of the Hen, by forcing Eggs to disclose their Young by the artificial Heat of an Oven ; and compel a Sprout that was contained in a Chaos of confused matter, to disengage and set it self free, to break

break its Bands, in which it would have continued for ever, if a foreign Heat had not kindled up that lurking Fire, and tempted that Captive, whom we could not properly call either dead or living, to come out from his obscure Prison. This is the destiny of all the Plants that are to be born of Seeds in the Spring. The Seeds, that are the Eggs of Plants, contain an Atom of Life, a sparkle of celestial Fire: but all this would perish with them, if from without them there came not a propitious Heat, to open the Covers, and to disclose the Plants, with which they are impregnate. *Veluti patet in ovorum excludione, tam per artificialem calorem furnorum, quam naturalem Gallinarum.*

By the like Mechanicks, the Seeds of our Barnacles disclose themselves in the Shells of our Anatiforous Plants, and give new Children to the Race of Water-Fowl. 'Tis not the Barnacle who hatches these Eggs. The Sun does the Mothers Office in regard to the Seeds of Plants, and to the Eggs of Animals, whose Blood is cold; 'tis he who kindles the sparkle of Life, contain'd in these Eggs, and without whose vivifying warmth, no living Being could ever be brought forth. *Sol magnus mundi Lumen, caloris Pater est, eumque mittit in terram omnia que vivificat & illustrat.*

All this I have taken from *Majerus*: but have not confin'd my self to so close a Version of him, as not to put in a little Commentary into my Translation; and I hope I have done him no wrong. The rest of his Physicks on this Subject, I take not to be Orthodox; and have therefore omitted them. To conclude;

clude, I presume I have sufficiently explain'd my Anathemous Plant, and the Origin of Barnacles; which I am sure has been done by no Man before me: I therefore hope the Publick will be satisfied with my Inquiries.

G. H. A. P. XV.
The Vegetable Phoenix; or the Miracle of the Regeneration, on even of the Resurrection of Plants from their Ashes.

I Undertake with Pleasure to treat of this Subject; which is so curious, and withal so noble, that a Man must be stupid and insensible indeed not to be mov'd at so great a Miracle. Nature and Art can go no farther: And we are going to see some Experiments, that employ and exhaust all the force of Nature, and all the subtlety of Art. Nor can both of them in concert together, present any thing to mortal Eyes, that more deserves their Admiration.

The Matter now in Hand is the *Palingenesis*, that is to say, the Resuscitation of a Plant, that is dry, dead, and even reduc'd to Ashes. What can be greater than to recall from Death to Life? And yet the Chymical Philosophers pretend, that by their Art they can restore a Body that has been destroy'd by Fire, and make it retake its primitive Form.

Olaus Borrik says, that having for a whole year together, tormented some Quicksilver by many Fires, even to the Reduction of it
 into

into Water, Turbith and Ashes, it retook its first Form by the Attraction of Salt of Tartar.

He likewise assures, that Lead being reverberated into *Minium*, melted into Glass, reduc'd into Ceruss, and burnt into Litargie, retakes also its first Form in a moment, if a Lixivate Salt be artfully applied to it.

We have shewn in page 186. when we were speaking of Salts, that *Boyle* had discovered that Nitre would restore and revivifie it self in such a manner, that after he had carried it thro' a long Course of Operations, he found it again at last whole and intire, and even Weight for Weight. It must be confess'd, that there is something in Salts, that Philosophy cannot yet give any Account of. Whatever it be we have a high Opinion of it, but not answerable to its Excellence. It has indeed been said, that Salts in mixt Bodies, bind the Principles together, and give a State of Consistency to Elementary Bodies; and that without Salts, the hardest Minerals would fall to pieces, and crumble of themselves into Dust. This Thought, how home soever it seems, falls short of what it should say. Shall I venture a step farther, and advance, that the Essence and Substantial Form of each Elementary Body consists in its Salts; and that the difference of Salts makes the specifick difference of every mixt Body. What persuades me that this is true, is because when a Body is destroy'd, pull'd to pieces, and reduc'd into Ashes, we find again in the Salts, extracted from its Ashes, the Idea, the Image, and the Phantom of the same Body. The Features, the Lineaments are all recover'd in its Ashes: If we

could rejoin to them the other Principles, 'twould be no longer the Image of the thing, but the thing it self restored in all its parts. This would be a Resurrection indeed : but to this neither Nature, nor Art, nor both of them together will ever be able to attain.

But without having recourse to the Necromantick Spells of the Witch of *Endor*, without making *Samuel* appear ; at least by an innocent Magick we will raise up the Phantoms of Plants that are rotten, and reduc'd into Ashes : perhaps too we may go farther : for what should hinder us from performing upon Animals, what has already been so successfully effected on Plants. Where would be the harm of raising up the Phantome of the Dog, whose loss *Ulysses* so bitterly bemoan'd : or of the little Cat, for whose Death *Tertius* the Daughter of *Paulus Emilius*, so excessively griev'd ? We will promise nothing ; but try what we can do.

'Tis none of the least Curiosities of Art, to make the Images of Plants appear in a Vial, in which we preserve their Ashes : Nay, 'tis the greatest Curiosity in Nature. To resuscitate a Plant from the midst of its Ashes, as often as we please ; and so to give it a kind of Perpetuity, is the Miracle of Miracles. A Rose, that was so tender and delicate, and whose frail Beauty lasted so short a while, will become immortal by this Art. This is a Secret that deserves the Attention even of the greatest of Men.

ARTICLE

ARTICLE I.

The Regeneration of Plants.

Tho' it have been long doubted whether it could be effected or not; yet after the Experiments that have been made, there is no longer room for incredulity.

I. *Coxes* has made in *England* some most curious Experiments upon this Subject. After having drawn a great deal of Salt from Fern, he caus'd some of it to dissolve in the damp Air: after having dry'd it, what remain'd of the *Lixivium* became red as Blood. This Colour was a sign that there remain'd many sulphureous Parts. He put this Dissolution into a great Glass-Bottle, and after it had been there five or six Weeks, a great part of the Salt sunk to the bottom, and became of a brownish Colour, whereas that which was above was whitish. And then it was that on the surface of this Salt, Ferns were seen to rise up in great number.

When the Fern was burnt, it was between dry and wet: thus the Salt was as it were Tartarous and Substantial. Being dry'd before a great Fire, it lost much of its Weight, and became whiter: The Reason of which was, because it had before some Oil and some Acids.

Having mingled an equal Quantity of Pot-Ashes, and Sal Armoniack, a volatile Salt rise up immediately: and some time after, there appear'd a Forest of Pines, Firs, and other Trees, which he knew not. There is not in the World a more faithful Image of the Resurrection

urrection of the Dead, and I am persuaded that Nature and Art can never offer to our Eyes a more divine Spectacle. All the Learned speak of it alike; and each of them is astonish'd with Admiration. Let us hear how one of the most Learn'd Naturalists of *England* regarded this Object.

II. Sir *Kenelm Digby* was one of the first Admirers of the Regeneration of Plants. *We can*, says he, *raise up a dead Plant, and render it immortal*, and in making it revive from the midst of its Ashes, give it a sort of glorify'd Body: and such, if I may use the Expression, as we hope to see our own after the Resurrection. *Quercetan*, Physician to King *Henry IV.* tells us a wonderful Story of a certain Gentleman of *Poland*, who shew'd him twelve Glass Vessels, seal'd Hermetically, in each of which was contain'd the substance of a different Plant: In one was a Rose, in another a Tulip, and so on. It must be observ'd that in shewing each Vessel, nothing could be seen but a little Heap of Ashes that was at the bottom of it: but as soon as he expos'd it to a gentle and moderate Heat; even at the same Instant there appear'd by little and little the Image of a Plant, that arose out of its Tomb, or its Ashes. And in each Vessel the Plants and the Flowers were seen to rise up whole and intire, according to the Nature of the Ashes in which their Image was invisibly buried. Each Plant and Flower grew on all sides to a due and fitting size and dimension; and upon it were painted in Shadowings their proper Colours, Figures, Sizes, and other like Accidents: but so exactly and naturally, that

that the Sense might there have deceiv'd Reason, and made us believe them to be real and substantial Plants and Flowers. Now as soon as he withdrew the Vessel from the Heat, and expos'd it to the Air, so that the matter and the Vessel came to grow cool, the Plants and Flowers were plainly seen to diminish by degrees: and their shining and lively Hue turning to a pale, their Figure then was only a shadow of Death, and vanishing on a sudden, buried it self afresh under its Ashes. All this was again acted over, with the same Circumstances, as often as he approach'd the Vessels to the Fire, or withdrew them from it.

Athanasius Kircherus assur'd me for certain, when I was at *Rome*, that he had made the same Experiment, and he imparted to me the Secret of doing it: nevertheless after a deal of Toil and Labour I could never succeed in it. *Digby of the Vegetat. of Plants, part 2.*

That Learned Naturalist need not complain of his ill success in the Regeneration of Plants by their Ashes, since he owns himself that he had the satisfaction of seeing, of what Salts are capable, and how they contain the substantial Form of a mixt Body, dissolv'd. I succeeded, *says he*, in the second Operation, of which *Kircherus* gave me likewise the Secret. I took a good quantity of Nettles; the Roots, the Stems, the Leaves, and in a word the whole Plants, and calcin'd them after the usual manner. I observ'd exactly all the Circumstances that *Quercetan* relates. Of these Ashes of Nettles I made a *Lixivium* with clear Water, and filter'd it to take away the dead head of it, and expos'd it to the cold Air in frosty

frosty Weather. 'Tis most true that when this Water was frozen, there appear'd in the Ice, a great many Figures of Nettles. I took delight to regard this sport of Nature; and sent for Doctor *Mayerne*, that he might be a Spectator of this Transfiguration, at which he was no less surpriz'd and ravish'd than my self. Now what can be the cause of this Phænomenon? 'Tis certain that the greatest and most essential part of this dissolv'd mixt Body continues in its fix'd Salt, which cannot devest it self of the Impression it had received from Nature, continuing always essencify'd with the same Qualities and Virtues, as the Plant from which it is extracted.

After this he relates another very curious Experiment, that Doctor *Davisson* show'd him in his Laboratory at *Paris*. As he was extracting the Oil and the Spirit of a certain sort of gummy Rosin; it happen'd in the Operation, that the Neck of the Vessel, by which this Oil and this Spirit ascended, was interwoven all around with the Figures of Pines, which are the Trees from whence came the Rosin on which he was working. The Figures and Idea's of these Pines were represented so exactly, that *Apelles* could not have imitated them so well. The same thing happened to *Digby* himself as he was distilling the Gum of Cherry-trees. So true is it that the Idea's, the Shadows, the Phantoms of Bodies preserve themselves in the Salts that are extracted from them.

III. *Monconys*, in his Voyage to *Rome*, relates, that the famous *Kircherus* taught him this Operation, which cannot be easily effect-

ed,

ed, nor too much admir'd. Put into a Vessel the Spirit which you extract from the Herb Maiden-hair, and throw in all the Salt you can draw from the Calcination of its Dregs: seal it up Hermetically; and you will see the Plant grow in this Vessel in the Spring, and wither in the Winter; and do the like successively every Year. This were a Curiosity indeed if it could be effected, but I distrust that *Monconys* had added something of his own to what *Kircherus* told him.

IV. D. J. *Daniel Major* gives us an account of a new sort of Regeneration. He tells us, that he mix'd together the Salts of Plants, that he might see the Combats of the Acid and Alkali: and that to find the Result of these several mixtures, he put some Salt of Lavender into two Glass Vials, fill'd with Water. He was surpriz'd towards the Evening to see a World of little Plants as it were in Miniature, that rose up out of the Water, and rank'd themselves in order around the sides of the Vial, where they compos'd a little Forest of Lavender. The next Morning the sight was incomparably the more charming: for these small Vegetations had no doubt magnetically attracted to themselves the Salts of the Air. and that too in so great a quantity, that the little Forest was born down by its own weight to the bottom of the Vials. He warm'd his Vials gently a second time, and the same thing happened again. This little Forest lasted seven or eight Days, but it attracted the Salts of the Air with less and less avidity. Ravish'd at this Resurrection of his Lavenders that were burnt and sprung again from their
Ashes

Ashes, he call'd to mind the happy Resurrection of our Bodies ; and in the heat of the pleasing and pious transport that inspir'd him, he made the four following Verses.

*En redit ex gemino nemorosa Lavendula vitro.
Qua prius in terram versa salemque fuit :
Pulverulenta olim sic corpora nostra redibunt :
Et salia arcana quid Deitatis habent.*

We are obliged for these Observations to the Academy *Curiosorum Naturæ, Observat. 9. Anno 1677.*

V. *Ferrari* teaches the method of attaining to the Regeneration of Plants, by the means of the Salts extracted from their Ashes. He took it from the Writings of *Petrus Johannes Faber*, a Physician of *Montpellier* : but having never made trial of it himself, 'tis best to refer our selves to such as speak of their own Experiments. But he concludes the Method by these Words : Behold, says he, a new and wonderful Spectacle, that presents it self to the Eyes, and ravishes the Mind. No sooner we expose to the Sun, the Vial fill'd with the Quintessence of Roses, than we perceive within the streight Bounds of that small Vessel, a World of Miracles. The Plant that lay dead and buried in its Ashes, revives and rises up. In half an hours time this *vegetable, self-born Phoenix* springs from its own Ashes. This Rose, in Dust, comes out of its Tomb to take a new Life. This is a lively Image of the Resurrection, by which we Mortals, who are lying in the Shades of Death, shall arise to a blessed Immortality. *Florens Phoenix intra horæ dimidium suis cineribus renascitur : e terra tumulo vernam redit ad vitam rosa mortalibus ad immortalitatem*

mortalitatem surrecturis precludit. Flor. lib. 4. cap. 4.

VI. *Hannemannus* is fully persuaded of the Virtues of the Salts of Plants. He has included in a few Words almost all the Philosophy of these Salts. At first he says, that the Seed is the first Principle of Germination, and the last Complement of the Plant. *Semen primum progerminationis Principium, & ultimum Planta Complimentum.* He adds, that by the help of Fire, and by the Chymical Anatomy of the Seeds of Plants, we extract the Spirits, the fixt and volatile Salts, the Oils, &c. which we know to contain the first Principles of the Plants. These Plants are concenter'd in their Seeds. The Seed is the Plant folded and wrapt up. Whatever is contain'd in the Plant is united in the Seed: and by a great Miracle, whatever the Seed contains, is reduc'd into a less Bulk, in an Atom of Salt of the same kind of Plant. *Sales ex Plantis elicti habent Analogium cum seminibus; sunt Primordialia Plantarum, & rerum semina, forma Resuscitatrix, &c.* Hence *Paracelsus* took the secret of resuscitating Plants by their Ashes. He extracted from Plants an aqueous Matter, and an oleaginous Matter, with these he imbib'd their Ashes, which he regarded as a first Matter, upon which he sprinkled these dissolv'd Salts, that he call'd the substantial and revivifying Form of the Plant. Then he sow'd in good Earth these Ashes thus prepar'd, and they produc'd Plants of the same kind, as *Libavius* attests. Upon this Principle too it is that *Kircherus* affirms, that if we cut a Plant into little pieces, and reduce them into Ashes; and then sow the
Ashes

Ashes in the Earth ; Plants of the same kind will spring from them. *Rattray* assures us that one Horse radish, cut in twenty pieces, and put into the Ground, produc'd as many Horse-radishes. *Mersenne*, the Minim, having calcin'd a Plant between two Crucibles, and extracted the Salt, sow'd it in a prepar'd Earth, and there came from it a Million of the same Plants. From all which *Hannemannus* draws this Conclusion : If you sow the Salt of a Plant in a proper Earth, there will spring out immediately an infinity of Plants like to that whose Salt you sow. *Salem Planta, si terra purissima infereris, statim ille in eam Plantam ex qua extractus fuerat repullulabit.*

Thence he goes on to the Regeneration of Plants, and says: *Quercetanus* relates that a certain Physician of *Cracow*, had the first Principles of several Plants in several Glass Vials : where by the assistance of a little Heat, and without much trouble, he shew'd the Phantoms of these Plants, that arose from those Principles, but without being able to give themselves any Consistency : for the Heat was no sooner withdrawn, than the Phantom retired into its Tomb. The famous Minim *Chrysostom Magnan*, describes admirable well in his *Democritus reviviscens*, a Rose resuscitated from the midst of its Ashes. *Hanneman. Nov. Method. cognosc. simpl. Vegetab. Sect. 30. pag. 59.*

We must not expect a solid Body in this Apparition : 'tis only a Shadow ; and if any one should rashly go about to touch this resuscitated Rose, it would fare with him as with the sacrilegious *Ixion*, who thinking to embrace *Juno*, found only a flitting Cloud, without any Consistency.

VII. *Paracelsus* gives us a Method to produce a Plant by the means of its Salts. Take, *says he*, some Ashes of burnt Wood: Put them into a Cucurbite with some Rosin, Sap and Oil of the same Tree; of each an equal weight. By doing this, you make use of the three Principles of which all things are form'd; that is to say, the Flegm, the Grease and the Ashes. The Flegm is the Mercury; the Grease the Sulphur, and the Ashes the Salt: because all that steams and evaporates at the Fire, is the Mercury: all that takes Fire and burns, is the Sulphur: and all Ashes are Salt. Put therefore these three things into a Cucurbite, and with a gentle Fire these Matters will reduce themselves into Liquor; and then the whole will become mucilaginous. When you have thus got your three Principles mixt together, put the Vessel into the Belly of a Horse, for as long a time as is requisite for the matter to putrifie. And then if you lay this Matter in a good Earth, the Tree from which you extracted the three Principles you made use of, will soon revive from it. And the advantage of this Regeneration is, that such a Tree will have much more considerable Virtues than that from which it descends. *Paracels. Lib. 6. de Nat.*

They who are not us'd to the Style and Metaphors of the Chymists, must not be alarm'd at what *Paracelsus* says, that the three Principles must be put into the Belly of a Horse; it means no more than that the Vessel must be laid in Horse-dung.

Concerning this Method *Kircherus* frankly says: that 'tis too tedious, and that there needs
not

not so much Ceremony to make the Salts of Plants vegetate. We have nothing to do, *says he*, but to take some Salt of Wormwood, and sow it in good Earth; and you will have the satisfaction to see Plants of Wormwood spring from that Salt: as I have very often experimented. *Mund. subterr.* Tho' this Regeneration be very curious and Philosophical; and visibly demonstrates the great Virtues that are contained in Salts; 'tis certain that the Resurrection of Plants in Vials by the means of their Salts, has something more sublime and wonderful.

VIII. *Bary* in his Physicks, philosophizes after his own manner concerning the same Experiment of the *Polish* Physician. Tho', *says he*, the *Egyptians* have been blam'd for believing that the Souls of Plants returned into Matter; yet a certain *Polander* shut up the Manes of Plants in Glass Vessels; and by heating those Vessels which contain'd a kind of Ashes, he oblig'd the Seeds to pass from the Power to the Action; insomuch that in a short time there appear'd in the Glasses, Stems, Branches, Leaves and Flowers. The Plants indeed were short-liv'd, and continued no longer than the Heat of the Vessels lasted. *Bary Physique dernier. Part. Tom. 2. pag. 244.*

IX. The famous *Kircherus* starts at first this Question: Whether the *Palingenesia* or Resurrection of Plants from their Ashes, be a thing possible? Tho' he had no doubt, knowledge of it already, he decides nothing positively, but contents himself with saying: We will speak of this elsewhere, and shew the method to succeed in it. All I can now say is, that
 Count

Count *Martinitz* has made me a Present of such a secret. I am not at liberty to make it publick; because he communicated it to me on condition that I should not divulge it. I suppose that in 1654. *Kircherus* refus'd to make it known, because he would not break his Word with his Friend: but since that time he has certainly had his Consent to publish this so curious a secret: For 'twas not till 1660, that *Digby* writ his Treatise concerning the Vegetation of Plants: And perhaps it might be before that time, that *Kircherus* gave him that secret at *Rome*, from whence he says he brought it. *In Oedypo Ægyptiaco, & in Mundo Subterraneo de his omnibus amplior dabitur discernendi materia.* Kirk. Art. Magnet. lib. 3. cap. 4. Quæst. 1. Experim. 3.

At length we find that *Kircherus* declar'd himself concerning this Regeneration, that he believ'd it possible, and even that he had made Experiments of it, which succeeded to a Miracle: Insomuch that he kept ten Years in his Closet at *Rome*, a long-neck'd Vial, like a Matrafs, seal'd Hermetically, that contain'd the Ashes of a Plant, which he resuscitated in the presence of any, whose Curiosities brought them to see it. In 1657. he shew'd it to *Christina*, Queen of *Sweden*: and that learned Princess took pleasure in regarding this Prodigy for a great while together. *Kircherus* forgot to take this precious Vial from a Window, where it stood a whole Night, and a little Frost that happen'd, broke it to pieces. *Schotus* the Jesuit assures us, that when he was at *Rome*, he had the satisfaction to see this Rose, that they made rise out of its Ashes as often as they pleas'd by

the application of a little Heat: and that when a great Prince desir'd *Kircherus* to make one like it, he chose rather to part with his own, than undertake again such an Operation.

This Secret is call'd the *Imperial Secret*, because the Emperor *Ferdinand III.* who bought it of a Chymist, gave it to *Kircherus*, who has publish'd the following Method of it in his *Mundus Subterraneus*, Lib. 12. Sect. 4. cap. 5. Experiment. 1.

The Secret of the Palingenesia, or of the Resurrection of Plants.

1. Take four Pounds of the Seeds of the Plant, which you desire to raise up from its Ashes. This Seed must be very ripe. Pound it in a Mortar. Put the whole into a Glass Vessel, very clean, and as high as the Plant, whose Seed you have taken. Stop up the Vessel very close, and keep it in a temperate Place.

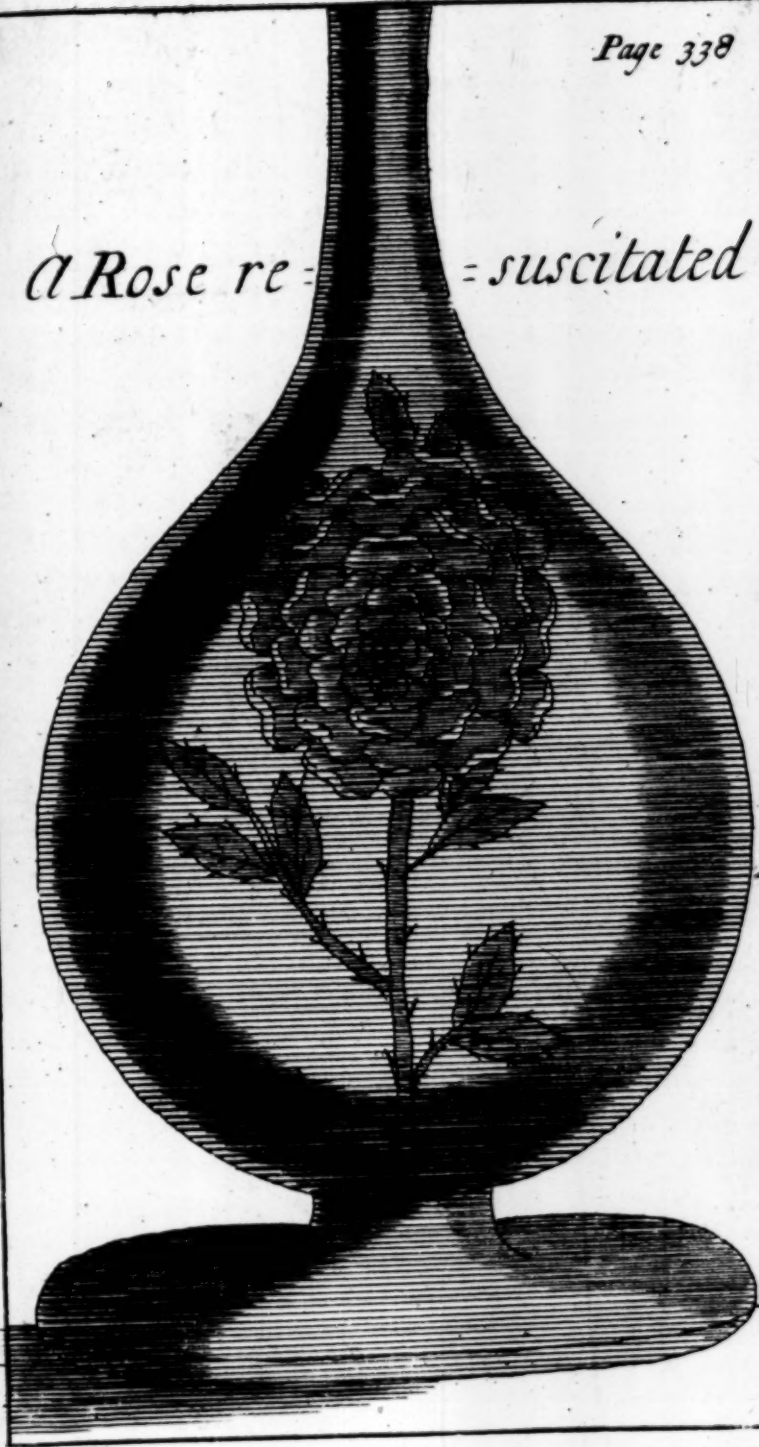
2. Chuse an Evening when the Sky is very serene and clear; and expose your pounded Seed to the Dew of the Night in a large Dish; that it may impregnate it self very strongly with the vivifying Virtue of the Dew.

3. With a large piece of Linnen Cloth very clean, and fasten'd down in a Meadow with a Peg at each Corner, get together eight Quarts of the same Dew, and put it into a very clean Glass Vessel.

4. Put your Seeds that have imbib'd the Dew into their former Vessel, before Sun-rising: because the Sun would make the Dew evaporate. Put this Vessel as before, into some temperate place.

5. When you have got Dew enough, you must filter, and then distill it, to take away all its foulness.

A Rose re- = suscitated





foulness. The Dregs that remain must be calcin'd, to extract a Salt from them, which will be of a beautiful Colour.

6. Pour the Dew that is distill'd and imbu'd with that Salt, upon the Seeds, and then stop up the Vessel again, with pounded Glass and Borax. The Vessel must be laid in this Condition, for a whole Month, in a Dung-hill of new Horse-dung.

7. Take the Vessel from the Dung-hil, and you will find that the Seed at the bottom is become like a Jelly. The Spirit will be like a little skin of divers Colours, and swim on the surface of the whole matter. Between the Skin and the slimy substance at the bottom, you will observe a sort of greenish Dew, that represents a Harvest.

8. During the Summer, expose this Vessel well-stopt, by Day to the Sun, and a Nights to the Moon. In misty and rainy Weather, you must keep it in a dry and warm place, till the Weather be fair again.

This Work is sometimes brought to perfection in two Months, and sometimes it requires a Year. The Tokens of success are, when we see the slimy substance swell, and rise up: when the Spirit or little Skin diminishes daily, and when all the matter grows thick. When by the Reflexion of the Sun we see some subtil Exhalations arise in the Vessel, and form themselves into thin Clouds, we may conclude them to be the first Principles of the regenerating Plant.

9. At length, of all this Matter there ought to form it self a blue Dust; and from this Dust excited by Heat, there will arise a Stem, Branches, Leaves and Flowers: in a Word, we

shall see the Apparition of a Plant rising from the midst of its Ashes. As soon as the Heat is withdrawn, all the Phantom vanishes away; the whole matter falls to pieces, and tumbles to the bottom of the Vessel, where it forms a new Chaos. The return of Heat always resuscitates this Vegetable Phoenix, that is hid in its Ashes: and as the presence of Heat gives it Life, its absence causes its Death.

Kircherus endeavours to give the reason of this wonderful Phænomenon, he says that the seminal Virtue of each mixt Body is concenter'd in its Salts; and that as soon as the Heat puts them in motion, they forthwith rise upwards, and circulate like a Whirlwind around the Glass Vessel. These Salts, being in this suspension, which sets them at liberty to dispose themselves into Order, place themselves in the same Situation, and form the same Figure, that Nature originally gave them. They range themselves in the same Order, as if they were in the Plant. Retaining the inclination to become what they were, they follow the first Impression they receiv'd. Each Corpuscle of Salt returns into the primitive Determination which it holds from Nature. Those that were at the Foot of the Plant, convey themselves thither, and place themselves as formerly. 'Tis the same thing too with those that compos'd the top of the Stem, the Branches, the Leaves and the Flowers: all retake their first Place.

X. *Georg. Philipp. Harstofferus* of Nuremberg, has publish'd likewise the Method of effecting this wonderful Regeneration. *Delic. Mathematic. Tom. 2. Part. 9. Quæst. 26.* It agrees not at all with that which *Dobrzenski* has made publick in

In his Works of Philosophy; but it is not unlike the Method of *Kircherus*, which is indeed tedious and troublesome.

XI. *Schotus* observes that *Balthazar Conradus* has try'd the Experiment in the Way that *M. Dobrzenski* of *Negropont* prescribes, but without any success: the reason whereof he believes to be, because that Method is neither enough exact, nor particular. *Certe D. de Negroponte non omnes Circumstantias enarrat, quas nos & Harstofferus habemus.* *Technic. Curios. Tom. 2. Lib. 9. cap. 16.* Then this learned Jesuit gives his Method, which he prefers before all the others. 'Tis the same with that of *Kircherus*, which I but now gave under the Title of *The Secret of the Palingenesia, &c.*

XII. *Dobrzenski* of *Negropont* says, that in his Travels thro' *Italy*, he met with an expert Chymist, who shew'd him in Glass Vials, an actual and real Re-production of several Flowers: which rise from the bottom of an oleaginous Matter, contain'd in those Vials, that were seal'd Hermetically: that there was no more to be done than to warm them a little, and immediately the Plants appear'd with their Leaves and Flowers: but that the moment the heat was withdrawn, all return'd into a confused Chaos, where nothing could be distinguish'd. *Philosoph. de Fontib. Part. 3. Propos. 1.*

This *Dobrzenski* of *Negropont* surpasses all other Naturalists in matter of Experiments. He makes the Regeneration of Plants very easie. But 'tis to be feared that he has not been particular enough; and that he has only given us the summary of an Operation, which is of too great Importance not to take up time. But he

does more than all this : for hitherto we have only seen the Apparitions of the shadows of Plants ; but he actually resuscitates a Plant that is dead and quite dry. His Method was thus.

A Miraculous Secret.

1. Take a dead Plant, but let the Root be on it. Put only this Root in a certain *Mineral Water* ; in three or four Hours the Plant will grow green again, and be like one that is in its full Vigour, and grows in the naked Earth.

2. If you put into a Vial some Water, distill'd from a Plant or a Flower, with three Ounces of Salt extracted from the same Plant or Flower, and then fill up the Vial with *Mineral Water* ; in two or three days you will see growing in the midst of this Water, a Plant of the same kind with that from whence you extracted the Water and the Salt. This Plant disappears if you shake the Vial ; but appears again as before, when the Vessel stands still. Nature and Art together, under the Hand and Eyes of the most skilful Artist, can do nothing else comparable to this.

The Reader will no doubt desire to know what this *Mineral Water* is ; nor can I blame his Curiosity, for without that Water, the two former Experiments can stand him in no stead. 'Tis made as follows.

A wonderful Mineral Water.

Take nine Pounds of Bismuth, before it has pass'd thro' the Fire, and put it into a Retort fit for it, and that has a great Recipient. Distill it for twelve Hours with a degree of Fire, proportionable to this Matter. There will rise a Water very white and sweet. Rectifie it twice or thrice, 'twill purifie it self and grow sweet-
er.

er. This Operation, for which we are oblig'd to *Dobrzenski* of *Negroponts* is neither long nor laborious. *Philosoph. amenior de Fontib. Part 3. Proposit. 1.*

But besides the two last mentioned Experiments, this learned Man employs this Mineral Water for a third, which is worth at least both the others. We are now got into the Country of sublime Curiosities; and I am of Opinion, that all the rest of *Europe*, and the three other Parts of the World put together, can offer us nothing that comes up to the following Experiment.

Take a Pound of Mineral Water: put it in, to a Glass Vessel, large enough for one third of it to remain empty. You will see this Water rise up and swell, when the Moon is at full: and fall down and take up less Room than usual, at the new Moon: which never fails to happen at full and new Moon. Nevertheless the weight of the Water is always the same, whether it appear in a greater or less Quantity.

This Flux and Reflux is puzzling and hard to explain. 'Twould break the Brains of *Aristotle* were he alive again, and he would once more drown himself in the *Euripus*, because he could not understand it. But by the Way that Story hangs ill together: for *Diogenes Laertius* says, that according to *Eumolus*, *Aristotle* drank Poyson at seventy Years of Age, and dy'd of it.

XIII. *Planis-Campy* made too great a Figure among the eminent Chymists, not to be call'd in Evidence concerning a Curiosity, that employ'd all the Great Men of his time. He knew perfectly well the Excellence of Salts, which he regarded as the Substantial Form of

Bodies. This will visibly appear in the two following Experiments taken from him.

1. *Experiment.*

The Salt of Plants will serve instead of Seed, if it be extracted in this manner. Burn what Herb you please, and extract the Salt from it according to the Method of Physicks. From this Salt will spring a Plant, like that which was burnt: for such a Salt always retains the Nature and Qualities of the mixt Body, from whence 'twas extracted.

2. *Experiment.*

Take Nitre from the fat Earth that lies along the Brooks, that glide at the Foot of Mountains, where there are Mines of Gold or of Silver: Purifie this Nitre well, and mix it with Saturn: calcine both of them in a Vessel, Hermetically clos'd. Then put the whole into a Retort, to which you must fit a little oval Vessel, and lute the Joynts very well. Put into it several Leafs of the finest Gold. Put Fire under your Retort; and by little and little some Spirits will rise up and stick to the Gold. Increase your Fire till no more Spirits mount up. Then take off your Recipient, and seal it with the Seal of *Hermes*. Make a Lamp Fire under it, till there appear in the Vessel the Scene of the Universe in the Spring: that is to say, all sorts of Trees with their Blossoms, Meadows enamel'd with Flowers, Streams gliding through them, with ten thousand Fountains; some sprouting out of Rocks; others from knotted Oaks. You may observe likewise the Plains waving with Corn. Some Animals too will appear bounding over the Hills, and skudding along the Plains. But what most claims

claims our Admiration, is to see around the Globe a great number of Stars, some fixt, and others wandring. These are Miracles I could never have believed had not my Eyes been the irreproachable Witnesses of them. *Petite Chyrurg. chap. 22.* Thus we have the whole Universe in little. The Sphere of *Archimedes*, of which the Ancients so much boasted, deserves not to be named in Comparison of this Miniature of the whole Creation.

What more can be desired and added to these Wonders of the Regeneration of Plants? The Imagination is lost in them, and can go no farther. Some nevertheless have not been satisfied with resuscitating of Plants from the midst of their Ashes; but have endeavour'd to do the same thing on Animals; and have succeeded in their Attempt. Nay, I am not certain that *Gaffarel* did not design to try the Experiment upon Men, and to make the Spirits of the Dead appear in his Vials. We may best judge of his meaning by what he tells us of the Resurrection of Plants.

ARTICLE

ARTICLE II.

Of the Palingenesia of Animals.

I. *Gaffarel* had great Reason to put the *Palingenesia* among his *unheard of Curiosities*. Of all those, of which he treats, there is not one but is much inferior to it. 'Tis raising it to the highest degree of Miraculous, to form to our selves an Idea, of putting it in practice on the Ashes even of Animals, and perhaps too of Men. If *Artemisia* had known this secret, she would not have swallowed down the Ashes of her Husband *Manfalus*; but preserved them in an Urn of Chrystal, where the Shade, the Manes of the Deceas'd would have appeared to her whenever she desired it. *Gaffarel* had something like this in view, when speaking of the *Palingenesia*, he brings upon the Stage, the Shades of the Dead.

Da Chene, says he, one of the best Chymists of our Age, relates that he had seen at *Cracow* in *Poland*, a Physician of that City, who kept in Vials, the Ashes of almost all sorts of Plants; so that when any one came out of Curiosity to see, for Example, a Rose in these Vials; he took that in which he kept the Ashes of a Rose-Bush, and holding it over a lighted Candle, as soon as the Heat came to the Ashes, they began to move, and rise up like a little Dusky Cloud, which after some motion came at length to represent a Rose, so fair,

fair, so fresh, and so perfect, that one would have thought it palpable and sweet scented, as if it had grown on a Rose-Tree. This Learned Man said, that he had often endeavour'd to do the same thing; but that his Art failing him, Chance favour'd him with the sight of almost an equal Prodigy. As he was amusing himself with trying several curious Experiments, he among others extracted some Salts from burnt Nettles: and having set the Lixivium abroad in a Winter Night, the next Morning he found it frozen: but was surprized with Astonishment to see the several sorts of Nettles, their Forms and their Figures so naturally and so perfectly represented on the Ice, that growing and live Nettles, seem'd not more Nettles than they. At present, adds *Gaffarel*, this Secret is not so rare: for *du Claves*, one of the best Chymists of our Age, shews it every day. From all which we may draw this Consequence, that the Spirits of the Dead, which are often seen to appear in Church-yards, are natural; being the Forms of the Bodies interr'd in those Places: or their exterior Figure, not the Soul, or Phantoms fram'd by evil Spirits; nor *Genii* as some have believed. 'Tis certain that these Apparitions may be frequent in Places, where Battels have been fought. And these Shades are only the Figures of the dead Bodies, which the Heat excites and raises up in the Air. 'Tis a Question worth deciding, Whether these wonderful Forms, that are rais'd from the Ashes of Bodies, may serve as an undeniable Argument of the Resurrection,
of

of which many Philosophers were ignorant ?
Gaffarel Curioſiter. inouyes, page 100.

II. When I ſaid before, that Natural Philoſophers would at length carry their Experiments ſo far, as to arrive at the Incomprehenſible Myſtery of the Reſurrection. I launch'd not out ſo far as ſome may imagine. The Affair is already almoſt accompliſhed, they have gone from Vegetables to Animals, and have taken Compaſſion of that Race, to which Mankind has no ſmall Obligations. This is what a great Doctor in Theology has written to his Friend *Schotus*, who has printed at the end of his *Phyſica Curioſa*, a ſmall Treatiſe written by that Doctor, whom he calls *Prænobilis & Reverend. D. Godefridus Aloyſius Kinnerus a Lowenthurn, Juris utriuſque, & ſacra-ſanctæ Theologiæ, Doctor, ſauter, & amicus integerrimus.* This Naturaliſt, after complaining that by the Secrets which he had ſeen Printed, he could never arrive to the Regeneration of Plants, relates what *Martinus Kergerus* ſays in his *Book de Fermentat. p. 50.* 'Tis certain, ſays that Author, that in the ſubſtance of Salts, the ſpecifick Forms of the Bodies, from whence they are extracted, are contain'd: and tho' the Body it ſelf be deſtroy'd, we may preſerve this exterior Form, and ſee it under the Figure of a Shade, or of a ſubtil Cloud, compos'd of Vapours and Exhalations, almoſt in the ſame manner as we believe the Bodies of the Dead to be. when they appear in Church-yards. He adds: I am aſſured that this Reproduction has been effected, not only upon Plants, but alſo

also upon Animals. Particularly they speak of a little Sparrow, that was made appear in that manner, in a Vial where its Ashes were kept. There are some who write that *de Claves* a French Chymist, has shewn to several Persons the same thing. *Non solum in vegetabilibus se prestitisse, sed etiam in Passerculo se vidisse, pro certo quidam mihi narravit. Et sunt qui publico scripto confirmarunt, quod hoc ipsum Claveus Gallus, quasi publice pluribus demonstraverit.* Physic. curios. Append. Part. 2. cap. 1. Thus we have a Sparrow rais'd to Life, like a Phoenix, from the midst of its Ashes.

III. *Digby* has done more than this. From Animals that were dead, and pounded to Dust, he has drawn living Animals of the same Kind. Which made him say in favour of this Operation, for which he valu'd himself very much, that what had been done in regard to the Reproduction of Plants, was not to be compared with what he himself had experimented in relation to Animals. I cannot conceive, *says he*, how the Renovati-on or natural Representation of these Figures, can imitate the real Regeneration, which I my self have experimented on some sorts of Fish: For Example, take some Cray-fish, and wash them well to take away all the Grittiness, Boyl them two Hours in a good quantity of Rain-Water. Keep this Decoction. Put the Cray-fish into an Earthen Limbeck, and distill them till nothing rises any longer: Preserve this Liquor. Calcine what remains at the bottom of the Limbeck, and reduce it to Ashes in a Reverberatory: Extract the Salt

Salt from these Ashes with your first Decoction: filtrate the Salt, and take away all its superfluous humidity. Upon the Salt that remains fixt, pour the Liquor you drew by the Distillation, and put it into a moist Place, for Example, a Dunghill, that it may putrefie. This method I observed, and in a few Days saw little Cray-fish, no bigger than Millet-seeds, moving up and down in that Liquor. You must feed them with Ox-Blood, till they come to be as big as a Hazel-Nut; and then put them into a wooden Trough, fill'd with River-Water and Ox-Blood; and change the Water every three Days. By this means you will have Cray-fish as large as you please.

This is a more useful Experiment than the Regeneration of Plants in Vials. There is something solid in it. Not only the Sight, but the Taste likewise is here regal'd, and that too with Cray-fish, who have an excellent Virtue to purifie the Blood.

IV. I will conclude this subject of the *Palingenesia* with Boyle's Opinion of it: That Learned Person, who may deservedly be call'd the Oracle of experimental Philosophy, speaking of the Experiments that are *contingent*; that is to say, that succeed not always, advances what we have so often said, that the Salt contains the Image of the Plant, from which 'tis extracted: and that if we put some Salt of Wormwood into Spring Water, and expose it to the Air in Winter, that it may freeze: we shall infallibly see the Image of a Plant of Wormwood on the surface of the Ice. Then he adds: For my part



A Sparrow

resuscitated



I declare I could never bring this to pass. I could indeed perceive some extraordinary Figures on the Ice; as there will be on the Ice of all Water, into which we put some particular sorts of Salts: but the Wormwood appeared no more than any other Plant: and I much fear that they who boast of success, in these sorts of Experiments, brought their Imagination as well as their Eyes, to behold the Spectacle. *Et sane magnopere vereor, imaginationem non minus quam oculos ad hoc spectaculum adhibuerint.* Tentamin. Physiologic. pag. 43. Thus you see the whole Mystery of the *Palingenesis* overthrown at once, or at least render'd very doubtful. But Boyle himself sets it up again to a Miracle in the very same Page, where he says: 'Tis not long since I took some very good Verdegrease, that contain'd a great quantity of the saline Particles of the Husks of press'd Grapes, which are made use of to corrode Copper, in order to make Verdegrease. Of this I made a Dissolution, of a beautiful green Colour. I congeal'd this Dissolution with Salt and with Snow. And we saw with Astonishment upon that Ice some little Figures, that perfectly represented Vines. *Enim vero nos ipsi cum non ita pridem optima (eruginis, aque salinas nverum particulas in cuprum ab ipsis corrosus coagulatas copiose continet) solutionem pulcherime virescentum sale & nive congelassemus, figuras in glacie minuscule vitium speciem eximie referentes non sine aliqua admiratione conspeximus.* This Experiment only is sufficient to give Authority to all we have said concerning the *Palingenesis* or Regeneration of Plants and of Animals, by their
 Ashes.

Ashes. I leave it to them, who in Philosophizing on the Works of Nature, are chiefly desirous to adore the Greatness of God, to give their Opinion concerning this Zeal, this Inclination, this Emulation, that Matter always retains, to dispose and replace it self; as near as it can in the same Figure, which the Author of Nature originally impressed on it.

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